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Aslit, J. S. H.

Aslit's decimal coinage
with a proposal for...

London

1854

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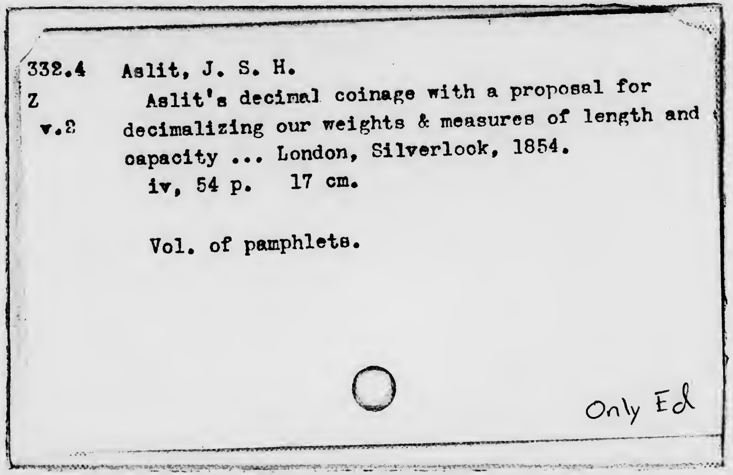

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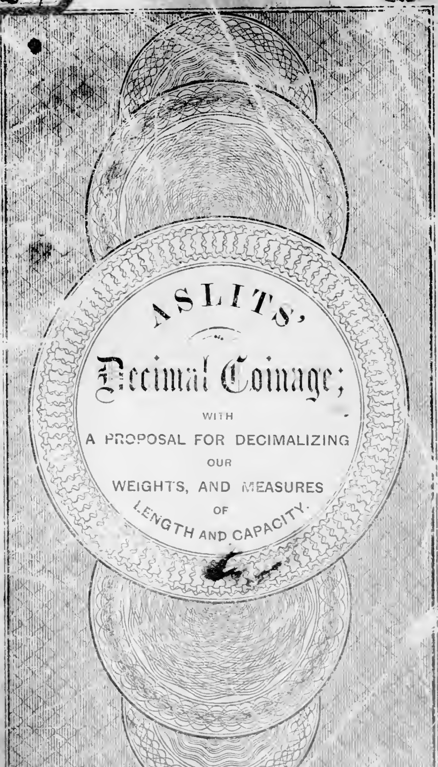
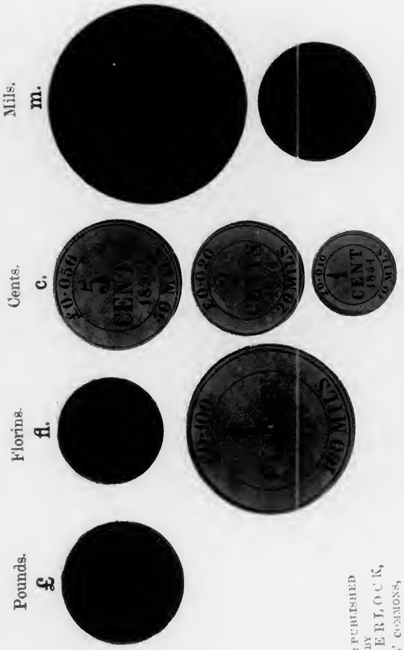


ASLITS'

Decimal Coinage;

WITH
A PROPOSAL FOR DECIMALIZING
OUR
WEIGHTS, AND MEASURES
OF
LENGTH AND CAPACITY.

1854



PROPOSED COINS.—*See page 21.*

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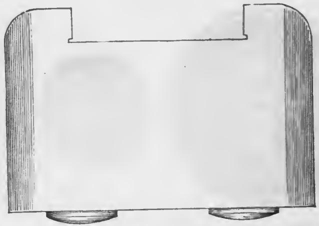
Plan for a Standard of Length.

Plate 2.



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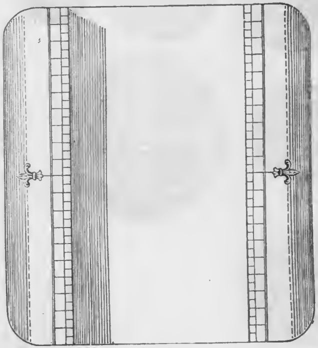

PLAN.

(See Page 34.)

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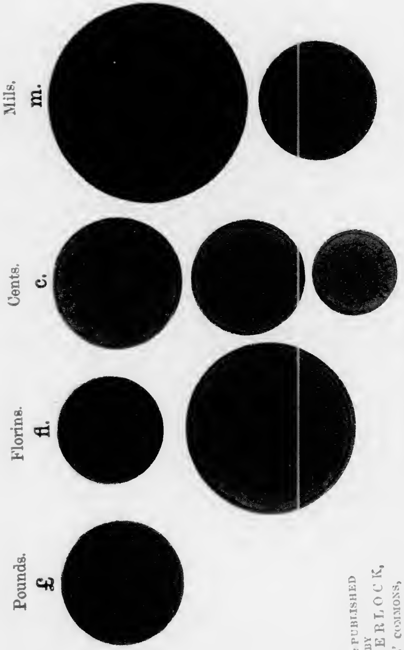

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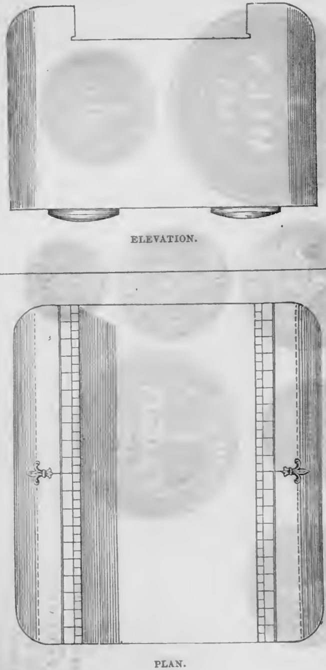

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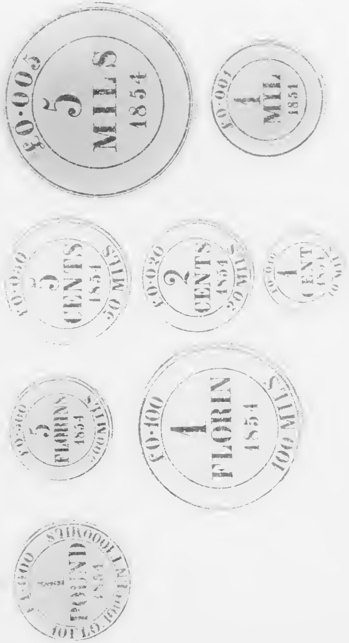

Plan for a Standard of Length

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ASLITS'

DECIMAL COINAGE;

WITH

A Proposal for Decimalizing

OUR

WEIGHTS, & MEASURES OF LENGTH AND CAPACITY.

ALSO A COPIOUS APPENDIX

OF THE PRESENT FRENCH & ENGLISH WEIGHTS & MEASURES.

London:
H. SILVERLOCK, 3, WARDROBE TERRACE, DOCTORS' COMMONS.

1854.
Price Sixpence.

H. SILVERLOCK, PRINTER,
WARDROBE TERRACE, DOCTORS' COMMONS, LONDON.

PREFACE.

SINCE the Decimal Currency Committee made their Report to the House, the press has been prolific of books on the subject of our currency; yet it is thought that the following pages will be found to contain matter not to be found in any other work on the subject—both with respect to the coinage, and weights and measures. A method is proposed for regulating tolls, in the event of the proposed system coming into operation. It is suggested that where the toll cannot be paid exactly, the receiver shall take for a part of the year the higher rate in mils of the nearest value, and for the rest of the year the next lowest number of mils. Two Schedules are given at page 41, to explain the proposed plan. Thus, suppose the present toll to be 2½d. By the first Schedule, the party receiving the toll would be allowed to take 10 mils for the first seven months, or 212 days, and 11 mils for the next five months, or 154 days. The loss would be 4 per cent.

on the low rate, and 5·6 per cent. gain on the high rate. Supposing the present toll to produce £100 per day, and the traffic to continue the same, the loss would be on the low rate £848, and the gain £862, being a gain of £14. The second part shows the effect of taking the high rate first. In either case the receiver is a gainer, to the trifling amount of 32 mils per cent. in the first case, and 28 in the second.

A proposal is made for decimalizing our weights and measures of capacity, so as to put them on a rational footing with a minimum of change. Should it be thought better to keep the gallon nearly as at present, it might be declared to be ·16 of a cubic foot, and let the pound be as proposed, thus making the gallon to weigh $8\frac{8}{9}$ lbs. But by far the best plan in the long run would be to make the cubic foot the unit of both weights and measures of capacity.

At the end of the book will be found Tables of our present weights and measures, and also those of the French compared with the English. At page 42, is given a number of useful constants, together with their logarithms, which latter have been carefully calculated for this work. The authority for the ratio of English

and French weights and measures is, the "*Annuaire pour L'An* 1844, *présenté au Roi, par le Bureau des Longitudes.*"

With respect to Education, it will easily be perceived that a very considerable time will be saved by the new system. Compound Addition, Subtraction, Multiplication, and Division, Reduction, Practice, will all cease to torment and perplex the young mind, and leave it free to learn other matters not now taught to a very considerable part of our population. There has always been a difficulty in teaching Decimal fractions, owing to our not having concrete quantities to work upon. This will be remedied by the new measures, and the teacher will no longer have to teach by abstract Decimal quantities. A Decimal coinage will enable the teacher to illustrate his meaning by something tangible, and thus remove nearly the whole of the difficulty. To say that a saving of one year's schooling would result, is not estimating it too highly, so far as arithmetic is concerned.

At the present time logarithmic arithmetic is almost unknown in the counting-house; but with Decimal systems of money, measures, and weights, a book of logarithms would be found on nearly every desk. These numbers are exceedingly useful in saving labour and time in making calculations. A curious illustration of the use of logarithms will be found at the end of the book.

Should Ministers contemplate a change in our measures and weights, it would be well to invite the government of the United States, and also the French government, to send each a Commissioner to take part in making the standards, in order to have the relation between the French and English weights and measures settled on a satisfactory basis. Any Commission appointed by the Crown ought to include two of the cleverest mechanical geniuses England has ever produced, viz., Babbage and Whitworth—men peculiarly fitted for dealing with standards of weights and measures.

J. S. H. A.

January 2nd, 1854.

INTRODUCTION.

On the 12th of April, 1853, the House of Commons ordered:—"That a Select Committee be appointed to take into consideration, and report to this House, the practicability and advantages, or otherwise, that would arise from adopting a Decimal System of Coinage."

The Committee consisted of the following members:—

Mr. WILLIAM BROWN.
" CARDWELL.
" JOHN BALL.
" TUFNELL.
" ALDERn. THOMPSON.
" DUNLOP.
" MATTHEW FOSTER.
Lord STANLEY.
Mr. MOODY.
" HAMILTON.
" J. B. SMITH.
Sir WILLIAM CLAY.
Marquis of CHANDOS.
Sir WILLIAM JOLLIFFE.
Mr. KINNAIRD.
Viscount GODERICH.

The witnesses examined were:—

THOMSON HANKEY, Jun., Esq., late Governor of the Bank of England.
JAMES LAURIE, Esq., Wine Merchant.
Lieut.-General PASLEY, K.C.B.
Professor AIRY, Astronomer Royal.
Sir JOHN HERSCHELL, Master of the Mint.
Professor DE MORGAN, London University.
THOMAS EMERSON HEADLAM, Esq., M.P.
Mr. FRED. STRUGNELL, Grocer, Edgeware Road, London.
R. C. L. BEVAN, Esq., Banker.
Mr. SAMUEL LINDSEY, Grocer, Lower Marsh, Lambeth.
Mr. CHARLES MEEKING, Draper, Holborn-hill.
GEORGE ARBUTHNOT, Esq., Auditor of the Civil List
Duke of LEINSTER.
Mr. WILLIAM MILLER, a Cashier in the Bank of England.
Mr. HENRY TAYLOR, Brewer's Clerk.

WILLIAM BROWN, Esq., M.P.
ROWLAND HILL, Esq., Secretary to the Postmaster-General.
Mr. FRANCIS BENNOCK, Commission Warehouseman.
JOHN BARON BEARD, Esq., Engineer and Architect.
THOMAS BAZELEY, Esq., President of the Chamber of Commerce, Manchester.
KENNETH DOWIE, Esq., Merchant, Liverpool.
Mr. HENRY KIRKHAM, Grocer's Clerk.
CHARLES HUTTON GREGORY, Esq., Civil Engineer.
Mr. JACOB ABRAHAM FRANKLIN, Accountant.
Dr. JOHN BOWRING.

The whole of the witnesses were in favour of a Decimal currency; and the Committee unanimously concurred in the opinion that—

"Great advantages attach to a decimal system, as compared with the present system of calculation."

That—

"With regard to the inconveniences of the existing system, the evidence is clear and decided. That system is shown to entail a vast amount of unnecessary labour, and great liability to error, to render accounts needlessly complicated, to confuse questions of foreign exchanges, and to be otherwise inconvenient."

That—

"The concurrent testimony of the various witnesses is to the effect that the adoption of a Decimal system would lead to greater accuracy, would simplify accounts, would greatly diminish the labor of calculations; and by facilitating the comparison between the coinage of this country, and other countries that have adopted the Decimal system, would tend to the convenience of all those engaged in exchange operations, of travellers and others."

The Report is a very able document, and strongly urges upon the Government to take immediate steps to bring about the new system. They report that—

"They have no hesitation in recommending the present pound sterling as the unit of the new system of coinage. The tenth part already exists in the shape of the florin or two-shilling piece, while an alteration of four per cent. in the present farthing, will serve to convert that coin into the lowest step of the Decimal scale which it is necessary to represent by means of an actual coin, viz., the thousandth part of a pound. To this lowest denomination your Committee

purpose, in order to mark its relation to the unit of value, to give the name of mil. The addition of a coin to be called a cent, of the value of 10 mils, and equal to the hundredth part of a pound, or the tenth part of the florin, would serve to complete the list of coins necessary to represent the monies of account, which would accordingly be pounds, florins, cents, and mils."

There is scarcely room for two opinions as to the unit. The nation having the most money requires the largest unit to measure it with.

The following passages occur in the Report, viz. :—

"Your Committee believe that no unnecessary delay should prevent the full introduction of the Decimal system, and they recommend that the necessary preparatory measures should be entered on at the Royal Mint as soon as possible."

"In conclusion, your Committee, having well weighed the comparative merits of the existing system of coinage and the Decimal system, and the obstacles which must necessarily be met with in passing from one to the other, desire to repeat their decided opinion of the superior advantages of the Decimal system, and to record their conviction that the obstacles referred to are not of such a nature as to create any doubt of the expediency of introducing that system, so soon as the requisite preparation shall have been made for the purpose, by means of cautious but decisive action on the part of the Government.

"They believe that the necessary inconvenience attending a transition state, will be far more than compensated by the great and permanent benefits which the change will confer upon the public of this country, and of which the advantages will be participated in to a still greater extent by future generations."

When we consider the character of the witnesses examined, the composition of the Committee and the tenor of their Report, there is little room left for doubt as to the doom of the present system, and the speedy introduction of a Decimal system. Such being the case, the sooner the public is made acquainted with the nature of the change, and familiarised with the new system, the easier will be the transition, and the sooner will the full benefit of it be realised by the community.

With this end in view, the following remarks have been brought together, in the hope that they may assist in some degree to bring about what is so much to be desired by all persons having anything whatever to do with keeping accounts. Our present systems of coinage, weights and measures, are of such a barbarous kind, as to create surprise that they should have been tolerated beyond the middle of the nineteenth century. Our children will wonder when told that we invented means to travel sixty miles an hour, and yet had 960 parts to a pound; electric telegraphs to convey messages, where time was no element in the transaction, and yet had *one hundred and twelve* pounds in an *hundred* weight. When they cast their eyes over such a list as the subjoined, of units in force up to the year 1854, they will indeed have cause to admire our patience, if they cannot commend our good sense, in allowing the continuance of such a state of things.

With respect to the Decimalization of our weights and measures, the Committee, only being appointed to consider the coinage, did "not feel themselves in a position to do more than express their sense of the importance of further enquiry into that interesting subject." Yet there can be no doubt but that a total change of our weights and measures must shortly follow the introduction of a Decimal system of coinage. An outline of a new system is here sketched out, which would entail perhaps as little inconvenience as any other, and from which several important advantages would arise. It would retain the quarter of the hundred weight, the hundred weight, and the half ton, within about 1-630th of each. In the Price Current of the *Economist* newspaper, 15th Oct., 1853, there are 169 quotations of prices per ton and cwt., and 142 per lb. Of the latter, the majority of them involve only a very inconsiderable amount of commerce; whereas, with respect to the ton and cwt., the whole of the commerce of the country is carried in vessels measured by the ton, and one-half their cargoes measured either by the ton or cwt. If we abide by the present pound, in a great number of pounds we shall depart widely from any weights we have at present, and be little able to form a comparison; whereas, by the proposed system, we never could be far from some standard of comparison: 25 lbs. would be within an oz. of a quarter of a cwt., and in the largest numbers we should come still nearer to some quantity with which we are now familiar.

A LIST OF SOME OF THE VARIOUS UNITS NOW IN USE, WITH THEIR SUB-DIVISIONS.

2	quarts ..	1	pottle.
2	cloves ..	1	stone of wool.
2	stone....	1	tod of wool.
2	loads	1	last.
2	weys	1	sack of wool.
2	gallons ..	1	peck.
2	reams ..	1	bundle of paper
2	bolls	1	sack.
2	bushels ..	1	strike.
2¼	inches ..	1	nail.
2½	feet	1	pace.
3	bushels ..	1	sack.
3	inches ..	1	palm.
3	feet	1	yard.
3	miles....	1	league.
3	scruples ..	1	dram.
3¼	cwt.	1	sack of wool.
3½	grains ..	1	carat diamonds
4	bushels ..	1	coomb.
4	inches ..	1	hand.
4	gills	1	pint.
4	quarts ..	1	gallon.
4	pecks....	1	bushel.
4	quarters. .	1	cwt.
4	nails	1	quarter.
4	quarters .	1	yard.
4	poles	1	chain.
4	roods	1	acre.
4	quadrants	1	circle.
5	bushels ..	1	load.
5	quarters .	1	load.
5	pounds ..	1	stone of glass.
5	feet......	1	geometrical pace.
5	score	1	hundred.
5	dog-skins	1	roll parchment
5½	yards	1	rod or perch.
6	score	1	great hundred.
6	feet	1	fathom.
6½	tods	1	wey of wool.
7	pounds ..	1	clove of wool.
7	lasts	1	hundred of salt.
7	pounds ..	1	gallon of flour.
$7\frac{23}{25}$	inches ..	1	link.
8	furlongs .	1	mile.

A LIST OF UNITS,—*continued.*

8 drams .. 1 ounce.
8 pints .... 1 gallon.
8 gallons .. 1 bushel.
8 bushels .. 1 quarter.
8 stone .. 1 cwt.
8 pounds .. 1 stone of meat.
8 eighths .. 1 inch.
8 half-crowns 1 pound.
9 inches .. 1 span.
9 square ft. 1 square yard.
10 pecks .... 1 boll.
10 reams .. 1 bale.
10 quarters .. 1 last.
10 skins .... 1 dicker of hides.
10 doz. pair . 1 ditto of gloves.
10 florins .. 1 pound.
10 chains .. 1 furlong.
10 square do. 1 acre.
$11\frac{4}{7}$ cwt. ..... 1 load of straw.
12 months .. 1 year.
12 inches .. 1 foot.
12 sacks .... 1 last.
12 barrels .. 1 last of soap.
12 sacks .... 1 chaldron.
12 ounces .. 1 pound troy.
12 articles .. 1 dozen
12 dozen .... 1 gross.
13 articles .. 1 long dozen.
14 pounds .. 1 stone.
14 ditto .... 1 peck.
14 inches .. 1 rod of brickwork thick.
16 sixteenths 1 inch.
16 drams .. 1 ounce.
16 ounces .. 1 pound.
16½ feet .... 1 rod, pole, or perch.
17 cwt. .... 1 last of flax.
18 barrels .. 1 last of salt.
18 cwt. .... 1 load of old hay.
19 cwt. .... 1 load of new do.
19½ cwt. .... 1 fodder of lead, London.
20 keels .... 1 collier load.
20 quires .. 1 ream.
20 grains .. 1 scruple.
20 fluid oz.. 1 pint.
20 cwt. .... 1 ton.
20 pennywts. 1 ounce.
20 pounds .. 1 score of meat.
20 articles .. 1 score.
20 shillings.. 1 pound.
20 dickers .. 1 last of hides.
20 sheets .. 1 quire outsides
21 cwt. .... 1 fodder of lead Newcastle.
$21\frac{1}{5}$ tons .... 1 keel of coals.
21¼ quires .. 1 printer's ream.
22 yards .... 1 gunter's chain.
22 cwt. .... 1 fodder of lead, Stockton.
24 sheets .. 1 quire.
24 grains .. 1 pennyweight.
24 hours .... 1 day.
24 stone .... 1 seam of glass.
24 barrels .. 1 last gunpowder
25 sheets .. 1 printer's quire.
27 cubic feet 1 cubic yard.
$27\frac{11}{32}$ grains .. 1 dram.
28 pounds .. 1 quarter cwt.
28 pound .. 1 tod of wool.
30 degrees .. 1 sign of Zodiac.
30 acres .... 1 yard of land.
30¼ square yds 1 square rod.
32 30-seconds 1 inch.
32 degrees .. 1 freezing point.
36 bushels .. 1 chaldron.
36 gallons .. 1 barrel of beer.
36 pounds .. 1 truss of straw.
36 trusses .. 1 load of straw.
39 cwt. .... 1 last of wool.
40 hides land 1 barony.
40 poles .... 1 furlong.
40 sqr. poles 1 rood.
40 ft. timber 1 load.
42 cubic feet 1 ton measurement.
45 inches .. 1 ell, English.
48 ft. timber 1 ton.
48 feet .... 1 navy log line.
50 feet .... 1 load of hewn timber.
53 cwt...... 1 chaldron, Newcastle.
54 gallons .. 1 hogshead.
56 pounds .. 1 firkin of butter.
56 pounds .. 1 truss of old hay
60 pounds .. 1 truss of new do.
60 seconds .. 1 minute time.
60 minutes .. 1 hour
60 seconds .. 1 minute angle.

A LIST OF UNITS,—*continued.*

60 minutes .. 1 degree.
60 minims .. 1 drachm.
60 skins .... 1 roll parchment
72 words .. 1 common law fo.
80 words .. 1 exchequer folio
80 deals .... 1 quarter.
88 pounds .. 1 bushel of coal.
90 words .. 1 chancery folio.
90 degrees .. 1 quadrant.
100 acres .... 1 hide of land.
100 feet .... 1 square of flooring, &c.
100 links .... 1 gunter's chain.
108 feet .... 1 stack of wood.
112 pounds .. 1 cwt.
120 gallons .. 1 pipe or butt.
120 articles .. 1 great hundred.
124 pounds .. 1 seam of glass.
128 feet .... 1 cord of wood.
144 square in. 1 square foot.
182 pounds .. 1 weigh of wool.
196 pounds .. 1 barrel of flour.
212 degrees .. 1 boiling point.
236 pounds .. 1 weigh of cheese
240 pounds .. 1 pack of wool.
252 gallons .. 1 ton of Greenland oil.
256 pounds .. 1 barrel of soap.
272¼ feet .... 1 rod brickwork.
277¼ cubic in. 1 gallon.
360 degrees .. 1 circumference.
364 pounds .. 1 sack of wool.
424 tons .... 1 collier load of coals.
500 r. herrings 1 cad.
500 bricks .. 1 load.
640 acres .... 1 square mile.
960 farthings . 1 pound.
1000 plain tiles 1 load.
1000 sprats .. 1 cad.
1728 cubicins. 1 cubic foot.
1760 yards .. 1 mile.
4568 pounds. . 1 last of wool.
4840 sqre. yds. 1 acre.
5760 grains .. 1 pound troy.
7000 grains .. 1 pound avoirdupoise.
100,000 square links .... 1 acre.

EXPLANATION OF SIGNS.

= equal to.
— minus *or* less.
+ plus *or* more.
× multiplied by.
÷ divided by.

MANY persons on seeing the above marks in a book, immediately conclude that it is all *Algebra*, and therefore close the book as being above their comprehension; while, in point of fact, they have no more to do with Algebra than the marks 1, 2, 3, 4 have. They merely form a very convenient bit of *short-hand;* each one standing for a word or short phrase, and thereby saving the time and space of writing. Thus, suppose I have frequently to write such as the following:—

45s. equal £2 5s.
84s. equal £4 4s.

If I were to draw two equal lines thus = between the quantities which are equal, it would save the time of writing and be equally intelligible.

Thus, £8 = 160s. = 1920d. means, and is as easily read as, £8 equal 160s. equal 1920d. If we wish to write £8 less by 4s., equal £7 16s.; or £8 minus 4s., equal £7 16s., we subtract one of the lines and put down as follows:—£8—4s. = £7 16s., and read it £8 minus 4s., equal £7 16s. Instead of writing plus, or added, we use +. Thus, 8 + 12 = 20, is read, 8 plus 12, equal 20. To show that two numbers are to be multiplied together, these two lines are crossed thus × and placed between them. Thus, 3 × 4 = 12, is read, 3 multiplied by 4, equal 12, or 3 into 4, equal 12. Instead of writing "*divided by,*" we put down two dots divided by a line, thus ÷; and 8 ÷ 4 = 2, is read, 8 divided by 4, equal 2.

These five simple marks are exceedingly useful, and are easily remembered. Instead of writing words between two numbers, we use short hand signs. Instead of writing the word "*equal,*" we put down two equal lines. Instead of "*minus,*" or "*take away,*" we take away one of the lines and put down the other. Instead of "*plus,*" or "*add,*" we add the line again, only in a different position, and put it down across the other, thus +. Instead of "*multiply,*" we bring the two lines into a leaning position, thus ×. Instead of "*divide,*" we divide two dots by a line, thus ÷, or we divide the numbers themselves by a line, putting the divisor at the bottom. A glance at the following must satisfy any one of the simplicity and utility of these signs.

8 + 4 = 12, means 8 plus 4 equal 12.
12 — 4 = 8, ,, 12 minus 4 equal 8.
4 × 8 = 32, ,, 4 multiplied by 8 equal 32.
8 ÷ 2 = 4, ,, 8 divided by 2 equal 4.
6 + 4 = 10. 8 × 4 = 64 ÷ 2 = 32.
£'s × 20 = shillings. £124 ÷ 6 = £20 13s. 4d.
(£20 13s. 4d.) × 6 = £124.

The ( ) show that all within them must be multiplied by 6.

8 ÷ 2 = 4; and 8 ÷ 2 = $\frac{8}{2}$. 4 ÷ 2 = 2. 1 ÷ 4 = $\frac{1}{4}$.

A penny divided amongst 4 persons each gets a farthing: or, 1d. ÷ 4 = $\frac{1}{4}$. £1 ÷ 20 = 1s. £1 × 20 = £20.

Pounds × 20 = shillings. Shillings ÷ 20 = pounds. This must be too simple to require another line.

DECIMAL COINAGE.

WHEN men first began to count, they were, no doubt, led to do so by tens, on account of the facility that the ten fingers would afford them. They would count as far as ten, and then begin again. The number of tens would be counted as far as ten tens, for which a specific name would be found; these tens of tens or hundreds would again be counted as far as ten hundred, and then another name for ten hundred; and proceeding in this manner, *ten* would become the *base* of our *scale of notation.* By means of a most admirable invention, introduced into Europe from the Arabs about A.D. 1000, we are enabled to express any number, however large, by means of ten simple marks, called the cipher and the nine digits; the relative position of each digit indicating whether it stands for units simply, for tens of units, or for hundreds, &c. Thus, 888 is composed of the same digit repeated three times, and it is the relative position of each which gives to it its real value; the 8 in the middle is ten times larger than the 8 on the right, and ten times less than the 8 on the left. We owe a very great deal of our present knowledge to this simple contrivance, which is so admirably adapted to the ends it has to serve. Though the ancient mathematicians thought and wrote very profoundly about numbers, their manner of writing them down and of operating upon them were exceedingly tedious and took up much of their time.

When we have £111 written down, we know at once that the 1 on the right stands for £1 simply; the 1 in the middle stands for ten times as much, or ten pounds; and the 1 on the left stands for ten times as much as the middle 1, or ten times ten pounds. This is because we have *agreed* that each position to the left shall stand for ten times more, and each position to the right for ten times less. Let us now *agree* that this arrangement shall be carried still further, and have a new position separated from the unit's position by a dot or point, thus:—£111·1; here 111 to the left of the point will stand for £111 as before; and the 1 to the right being by *agreement* ten times less than it would have been if standing in the unit's place, will therefore be only 1-10th of a pound; and as a florin is 1-10th of a pound, we may write £111·1 for £111 and 1 florin; and £222·2 for £222 and 2 florins. Five times this last amount will be five times two florins, equal one pound, added to five times £222, equal £1111·0.

This may be arrived at by simply multiplying by 5, thus:

$$\begin{array}{r} £222{\cdot}2 \\ 5 \\ \hline £1111{\cdot}0 \end{array}$$

Suppose I have 357 bars of gold, each worth £468 18s., what is the total value? Here I multiply 468 by 357, then 18 by 357, then divide this last by 20 to bring it into pounds and shillings, then add the pounds together, as follows:—

$$\begin{array}{r} 468 \\ 357 \\ \hline 3276 \\ 2340 \\ 1404 \\ \hline 167076 \\ 321\ 6 \\ \hline £167{,}397\ 6\text{s.} \end{array} \qquad \begin{array}{r} 357 \\ 18 \\ \hline 2856 \\ 357 \\ \hline 2{,}0)642{,}6 \\ \hline £321\ 6\text{s.} \end{array}$$

By the new method it is done simply as follows:—

$$\begin{array}{r} £468{\cdot}9 \\ 35\,7 \\ \hline 3282\,3 \\ 23445 \\ 14067 \\ \hline £167{,}397{\cdot}3 \end{array} = £167{,}397 \text{ and 3 fl., or 6s.}$$

I start on my journey with £123 6s., I bring home £17 18s.; how much have I spent?

$$\text{Usual method.. } \begin{array}{r} £123\quad 6 \\ 17\quad 18 \\ \hline £105\quad 8 \end{array} \qquad \text{New method.. } \begin{array}{r} £123{\cdot}3 \\ 17{\cdot}9 \\ \hline £105{\cdot}4 \end{array}$$

Division is likewise performed as in ordinary numbers.

EXAMPLE.—I paid £167,397 6s. for gold bars at £468 18s. each, how many did I buy?

$$\begin{array}{l} 468{\cdot}9)167397.3(357 \text{ answer.} \\ \phantom{468{\cdot}9)}14067 \\ \hline \phantom{468{\cdot}9)1}26727 \\ \phantom{468{\cdot}9)1}23445 \\ \hline \phantom{468{\cdot}9)1}32823 \\ \phantom{468{\cdot}9)1}32823 \end{array}$$

Multiplying and dividing by 10, 100, 1000, &c., is done by merely shifting the Decimal point, thus:—

$$48 \times 10 = 480. \quad 4{\cdot}8 \times 10 = 48. \quad {\cdot}025 \times 100 = 2{\cdot}5. \quad {\cdot}003 \times 1000 = 3.$$
$$478 \div 10 = 47{\cdot}8. \quad 8{\cdot}25 \div 10 = {\cdot}825.$$

What has been said of pounds holds equally good with florins.

Thus:—8·1 florins means 8 florins and 1-10th of a florin. Let the tenth of a florin be called a cent, then 8·4 florins will be the same as 8 florins and 4 cents.

Numbers with a Decimal point are called compound numbers. A sum of money may be expressed by means of these compound numbers, in either pounds, florins, or cents, at pleasure. Thus—

$$\overset{£}{8{\cdot}8} = \overset{\text{F.}}{88} = \overset{\text{C.}}{880} \text{ and } \overset{\text{C.}}{8} = \overset{\text{F.}}{{\cdot}8} = \overset{£}{{\cdot}08} \text{ because}$$

$$\overset{\text{C.}}{8} \times 100 = \overset{\text{C.}}{800} = \overset{£}{8} \qquad \overset{\text{F.}}{{\cdot}8} \times 100 = \overset{\text{F.}}{80} = \overset{£}{8} \qquad \overset{£}{{\cdot}08} \times 100 = \overset{£}{8}$$

We may now introduce the tenth of a cent and call it a mil; we shall then have in place of the common pence table the following:—

$$\begin{array}{r} \text{mils.} \\ 10 = \text{1 cent.} \\ 100 = 10 = \text{1 florin.} \\ 1000 = 100 = 10 = \text{1 pound.} \end{array}$$

We have seen that a sum of money may be expressed in either of the three first denominations; it may also be expressed in mils. £1·111, 11·11 florins, 111·1 cents, 1,111 mils, are all equal in value; for let each be multiplied by 1000, and we have £1,111, 11,110 florins, 111,100 cents, and 1,111,000 mils. The first evidently becomes pounds at once; and florins divided by 10 become pounds, cents divided by 100 become pounds, and mils divided by 1000 become pounds; these operations are simply performed by taking away the ciphers, they then become all alike. To reduce quantities from one denomination to the next higher, shift the Decimal point one place to the left. To reduce them to the next lowest, shift the Decimal point one place to the right. Compare the simplicity of this with the following, which is taken from an excellent work on Arithmetic.

"GENERAL RULE FOR REDUCTION.

"I. To reduce quantities of given denominations to equivalent quantities of lower denominations.

"RULE.—Multiply the quantity of the highest denomination by that number which it takes of the next lower denomination to make ONE of the higher; and to the product add the quantity of the lower denomination given in the question, if any. Proceed in the same manner with the quantity thus obtained, and those of each successive denomination, till you come to the denomination required.

"II. To reduce quantities of given denominations to equivalent quantities of higher denominations.

"Rule.—Divide the quantity of the given denomination by that number which it takes of this denomination to make one of the next higher. Proceed in the same manner with this and each successive denomination till you come to the required denomination; the last quotient, with the several remainders, will be the answer sought."—*Cassell's Arithmetic.*

Accounts may be kept under the head of either £, F, C, or M, as we please. The following will shew this clear enough:—

Pounds.		Florins.		Cents.		Mils.
124·045	=	1240·45	=	12404·5	=	124,045
1·325	=	13·25	=	132·5	=	1,325
·001	=	·01	=	·1	=	1
3·104	=	31·04	=	310·4	=	3,104
42·300	=	423·00	=	4230·0	=	42,300
3·000	=	30·00	=	300·0	=	3,000
£173·775		F1737·75		C17377·5		M173,775

Or what would be much better, under the heads of £, F, C, and M, as follows:—

£	F.	C.	M.
124	0	4	5
1	3	2	5
0	0	0	1
3	1	0	4
42	3	0	0
3	0	0	0
173	7	7	5

With our present currency we often say, five-and-twenty shillings, six-and-thirty shillings, sixteen-pence, eighteen-pence, &c., instead of one pound five shillings, one pound sixteen shillings, one shilling and fourpence, &c. And in

the new currency one man will express himself in one way, and another man in another way. The first of the above sums might be called either 124 pounds 45 mils, or 124 pounds 4½ cents.

£1·375 may be put down in the following different ways:

$$\overset{\pounds}{1}\ \overset{F.}{3}\ \overset{C.}{7}\ \overset{M.}{5} = \overset{F.}{13}\ \overset{C.}{7}\ \overset{M.}{5} = \overset{F.}{13}\ \overset{M.}{75} = \overset{C.}{137}\ \overset{M.}{5} = \overset{\pounds}{1}\ \overset{C.}{37}\ \overset{M.}{5} = \overset{\pounds}{1\tfrac{3}{8}} = \overset{F.}{13\tfrac{3}{4}} = \overset{C.}{137\tfrac{1}{2}} = \overset{M.}{1375}.$$

Sixpence in the new currency will be 25 mils, or 2 cents and 5 mils, or ·25 florin. A shilling will be ·25 fl. × 2 = ·5 fl. One shilling and sixpence will be = ·25 fl. × 3 = ·75 fl. A florin will be = ·25 fl. × 4 = 1·00 fl.

s.	d.		£		F.		C.		M.
0	6	=	·025	=	·25	=	2·5	=	25
1	0	=	·050	=	·50	=	5·0	=	50
1	6	=	·075	=	·75	=	7·5	=	75

Any number of sixpences may easily be put Decimally from the above. For instance—

$$\overset{S.}{13}\ \overset{D.}{6} = \overset{F.}{6} \text{ and } \overset{S.}{1}\ \overset{D.}{6} = \overset{\pounds}{6{\cdot}75}\ .\ \overset{S.}{9}\ \overset{D.}{6} = \overset{F.}{4} \text{ and } \overset{S.}{1}\ \overset{D.}{6} = \overset{F.}{4{\cdot}75}\ .\ \overset{S.}{14}\ \overset{D.}{6} = \overset{F.}{7{\cdot}25}$$

TABLES of the new currency from 6d. to 19s. 6d., advancing by 6d., and from ¼d. to 5¾d. advancing by ¼d.

DECIMAL PARTS OF A POUND.

s.	d.	mils.	s.	d.	mils.	s.	d.	mils.	s	d.	mils.
0	6	= ·025	5	6	= ·275	10	6	= ·525	15	6	= ·775
1	0	= ·050	6	0	= ·300	11	0	= ·550	16	0	= ·800
1	6	= ·075	6	6	= ·325	11	6	= ·575	16	6	= ·825
2	0	= ·100	7	0	= ·350	12	0	= ·600	17	0	= ·850
2	6	= ·125	7	6	= ·375	12	6	= ·625	17	6	= ·875
3	0	= ·150	8	0	= ·400	13	0	= ·650	18	0	= ·900
3	6	= ·175	8	6	= ·425	13	6	= ·675	18	6	= ·925
4	0	= ·200	9	0	= ·450	14	0	= ·700	19	0	= ·950
4	6	= ·225	9	6	= ·475	14	6	= ·725	19	6	= ·975
5	0	= ·250	10	0	= ·500	15	0	= ·750			

Pence, with the number of mils of nearest value.

¼ = 1	1¼ = 5	2¼ = 9	3 = 13	4 = 17	5 = 21
½ = 2	1½ = 6	2½ = 10	3¼ = 14	4¼ = 18	5¼ = 22
¾ = 3	1¾ = 7	2¾ = 11	3½ = 15	4½ = 19	5½ = 23
1 = 4	2 = 8	3 = 12	3¾ = 16	4¾ = 20	5¾ = 24

TO CONVERT OLD CURRENCY INTO NEW.

The price of gold at the Bank being £3 17s. 10½d. per troy ounce, this in new currency may be put down as follows:—

£	S.	D.		£	F.	C.	M.
3	0	0	=	3	0	0	0
0	16	0	=	0	8	0	0
0	1	0	=	0	0	5	0
0	0	6	=	0	0	2	5
0	0	4½	=	0	0	1	9
3	17	10½	=	3	8	9	4

Bear in mind that a shilling is 50 mils, and that the same number of farthings and mils agree as far as threepence, then we have—

D.		MILS.
12	=	50
11¾	=	49
11½	=	48
11¼	=	47
11	=	46

Perhaps the best way will be to bear in mind that sixpences are 25 mils, and in looking at a sum of money to see how many florins and sixpences it contains,—thus, 19s. 11½d. contains 9 florins and 3 sixpences = 9 florins 75 mils, leaving 5½ which is another 6d., or 25 mils minus 2 mils = 23. We thus have at a glance—

£	S.	D.		£
19	19	11¾	=	19·000
				·900
				·075
				·024
				19·999

For the number of farthings below threepence take the same number of mils, and over threepence take one more, and for threepence take the same number, or one more as you please, the small error will be the same in both cases. Thus—

2¾d. = 11 farthings = 11 mils.
3¼d. = 13 „ = 14 „
4¾d. = 19 „ = 20 „

£19 19s. 11¾d. Here,

£19 = 19,000 mils.
19s. = 19 × 50 = 950
11¾d. = 1s. — ¼d. = 50 — 1 49
19,999 = £20 — 1 mil,

or 19 pounds, 9 florins, 9 cents, 9 mils.

To gain the utmost advantages from a Decimal currency, we must have it combined with a system of Decimal weights and measures. Suppose we take the present pound, and as a base found upon it a Decimal scale of weights, as in Table B.* If gold be £3 17s. 10½d. per troy ounce, it will be £5·661 per new imperial ounce of 10 to the avoirdupois pound. Now as a pound is 10 ounces, a pound of gold will be ten times as much as an ounce, and therefore £5·661 × 10 = £56·61 the price per pound, the price per dram will be one tenth the price per ounce, £5·661 ÷ 10 = 5·661 fl. The price of gold from a great ton to a grain may thus be shown by the same figures, only differently placed, as follows:—

A great ton of gold, value	566,100 pounds.
A little ton	56,610 pounds.
A cwt.	5,661 pounds.
A stone	566·1 pounds.
A pound	56·61 pounds.
An ounce	5·661 pounds.
A dram	5·661 florins.
A scruple	5·661 cents.
A grain	5·661 mils.

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* See Page 18.

TABLE B.

NEW WEIGHTS.	OLD WEIGHTS.
1 Grain	$\frac{7}{10}$ of a grain.
10 = 1 Scruple	7 grains.
100 = 10 = 1 Dram	$3\frac{1}{2}$ scruples.
1,000 = 100 = 10 = 1 Ounce	$1\frac{6}{10}$ ounce.
10,000 = 1,000 = 100 = 10 = 1 POUND	Pound.
100,000 = 10,000 = 1,000 = 100 = 10 = 1 Stone	10 Pound.
1,000,000 = 100,000 = 10,000 = 1,000 = 100 = 10 = 1 Cwt.	$\frac{25}{28}$ cwt.
10,000,000 = 1,000,000 = 100,000 = 10,000 = 1,000 = 100 = 10 = 1 Litton	$8\frac{13}{14}$ cwt.
100,000,000 = 10,000,000 = 1,000,000 = 100,000 = 10,000 = 1,000 = 100 = 10 = 1 Gretton	$4\frac{13}{28}$ tons.

These weights are on the basis of the Avoirdupois pound decimalized.

The ship "Casket" brings home from Melbourne 86,874·48356 pounds of gold: what is the value of it?

The price per pound does not contain any odd mils; we must therefore bring the above quantity of gold into ounces, and multiply it by the number of pounds, florins, cents, and mils per ounce, as follows:—

868744·8356
5·661

8687448356
52124690136
52124690136
43437241780

£4917964·5143316

Having four decimal places in the multiplicand, and three in the multiplier, we cut off seven places in the product, giving £955,262 5 florins 14 mills—the 3316 is rejected, being only $\frac{3316}{10000}$ of a mil.

If we have 9 oz. of gold at £5 per oz., the value will be the same as if we had 5 oz. of gold at £9 per oz.; we may therefore change the numbers and the answer will be the same. We may have 5·661 oz. at £868,744·8356 per oz., and if we multiply the quantity by 1000, and divide the price by 1000, we shall still have the same amount for answer. We may therefore have 5,661 oz. at £868·7448356 per oz We can see clearly that the last three decimals, 356, will amount to nothing in the odd oz., and so very little in the 60 oz., or even in the 600 oz., yet they were all included in our last operation; the consequence was that we had four decimals more than we required. In the following method we much shorten the operation:—

868·7448356
1665

4343724178
521246901
52124690
868745

£4917964·514

This method may be described as follows:—Put down the quantity having the largest number of figures in it for a multiplicand, shift the decimal point as many places to the left as there are decimal places in the other quantity which you make the multiplier, placing its unit figure under the mils place, or third decimal place, and invert the order of the other figures. I then say 5 × 6 = 30. I put nothing down but carry the 3, saying 5 × 5 = 25, and 3 make 28; put down 8 carrying the 2, and proceed in this manner to the end of the line. I next say 6 × 5 = 30; put nothing down but proceed 6 × 3 = 18, and 3 I carry make 21; put down 1, carry 2, and proceed to the end of the line. I thus multiply only that part of the multiplicand over and to the left of the figure I multiply by, finding mentally what to carry to it. Over the 1 is a 4, aud as the figure to the right is more than 5 I carry 1. Then add the result, point off three decimals, and the operation is complete and accurate, saving 14 figures.

The advantages of a Decimal system would be very great to retail dealers. Suppose the Decimal system adopted at Smithfield having 10 lbs. to the stone, and 10 oz. to the lb. If meat were 3 florins per stone, it would be 3 cents per lb. and 3 mils per oz. This is an advantage of no small magnitude to a class of men dealing in what is continually varying in price at the wholesale market, and which has to be cut up into different-priced quantities.

Tea 2 florins per lb. = 2 cents per oz.
2·4 „ = 2·4 „
Cheese 42 mils per lb. = 4·2 mils per oz.

TABLE OF THE DECIMAL PARTS OF A TON.

cwt.	qr.		ton.	cwt.	qr.		ton.	cwt.	qr.		ton.	cwt.	qr.		ton.
0	1	=	·0125	2	3	=	·1375	5	1	=	·2625	7	3	=	·2875
0	2	=	·0250	3	0	=	·1500	5	2	=	·2750	8	0	=	·4000
0	3	=	·0375	3	1	=	·1625	5	3	=	·2875	8	1	=	·4125
1	0	=	.0500	3	2	=	·1750	6	0	=	·3000	8	2	=	·4250
1	1	=	·0625	3	3	=	·1825	6	1	=	·3125	8	3	=	·4375
1	2	=	·0750	4	0	=	·2000	6	2	=	·3250	9	0	=	·4500
1	3	=	·0875	4	1	=	·2125	6	3	=	·3375	9	1	=	·4625
2	0	=	·1000	4	2	=	·2250	7	0	=	·3500	9	2	=	·4750
2	1	=	·1125	4	3	=	·2375	7	1	=	·3625	9	3	=	·4875
2	2	=	·1250	5	0	=	·2500	7	2	=	·3750	10	0	=	·5000

THE COINS.

(See Frontispiece.)

In the introduction of a Decimal system of coinage, it would help to facilitate the change, by having the value of each coin, in relation to the others of the system, marked upon it in a distinct manner, by plain figures and letters. Flourishes and German text might be dispensed with at first. There is plenty of room for the display of Art in Her Majesty's effigy on one side, and let the people have the other. Our engraver has given examples which have received the strongest commendation from persons well qualified to give an opinion on such matters. Each coin shows its relation to the highest and the lowest of the scale, and the upper part of each shows the figures which would have to be put down in entering it in a book of accounts. It is strongly recommended that only the one and the five-mil pieces be coined in copper, in order to compel the more general use of the mil; this would be a great boon to the poor, who at present often lose the farthing in consequence of its limited use. If another should be deemed necessary, let it be a three-mil piece. *There can be no saving of either bulk or weight by the adoption of more.* A broad rim round each, as shown in the frontispiece, with the letters in the rim recessed, and those in the centre part in relief, would wear well and look well. The tops of the centre figures and letters made flush with the rim, would always wear bright, while those in the rim, would become dark, and thus all would be distinctly visible.

DECIMAL WEIGHTS & MEASURES.

In contemplating a change in our weights and measures, we are forcibly struck with the importance of not interfering with the length of the lineal foot. Our surveys, maps, charts, land marks, title deeds, &c., all remind us of the utter impropriety of interfering with it. When the French abolished their foot, they committed a grand mistake. Whoever has seen the French metre in the hands of a mechanic, must be fully impressed with the utmost contempt for such an article—a thing with nine joints in about three feet, each joint marking a decimetre. And French artizans are to be bothered for ever with this awkward production of the French *savans*, in order that they, the *savans*, might have a ten-millionth part of the earth's quadrant for an unit. And yet they are as far from it as ever; for, although they took the most admirable means to measure a degree of the meridian, they, soon after the establishment of their metre, found that their latitudes were wrong, and consequently their metre. With respect to our own foot, although it would be extreme folly to make any material alteration in its length, yet a Decimal subdivision of it could not fail to be exceedingly agreeable to artizans, and others having to make frequent use of it. The present division into 12, then 8, then 2, is very inconvenient in finding areas and volumes. The duodecimal multiplication is very tedious, and difficult to learn, and remember without constant use, and in its results very unsatisfactory.

Things measured by the foot may endure for ages, whereas most things measured by the pound or gallon are perishable; and it is not of so much importance to retain an inconvenient unit of weight, or volume, as of length. In forming a system of Decimal weights, and measures of volume, we should endeavour to have the unit of volume easily found from the unit of length, and the unit of weight easily found from the unit of volume. By the act of Parliament now in force, the yard is declared to be the unit of length, and the gallon is declared to be as much water as will weigh ten pounds. The only link to connect the gallon with the yard is the weight of a cubic inch of water, which is declared to be of the weight of 252·458 grains, and 70,000 such grains make a gallon, and 7,000 of them a pound Avoirdupois. The cubic inch being $\frac{1}{46,656}$th of our cubic standard, makes a very pretty medley. If we attempt to find the capacity of a gallon from these data, we find it impossible. In cubic inches it will be 277·27384357002 nearly. This is generally taken at 277·274, and if there is no great error involved in so taking it, there could have been no great difficulty in making it so legally, and declaring it to be a legal ten pounds weight. Bad as it would have been, it would have been much better than having no gallon at all; for the word gallon is only a name for ten pounds of water, and is not, and cannot be, a measure of volume. *No man can give accurately the dimensions of a gallon measure, of any shape or form.* If we proceed in a rational manner, the foot must become the standard unit, and the inch must vanish and give place to the tithing (Ty) of the foot. A gallon in cubic tys would be 160·4594002143169 nearly. The pound and the gallon must each be decimalized, and then their multiples and submultiples will differ from any units now in use; and if we can alter the gallon and pound themselves so that the *general difference* shall be less than by retaining them as at present, and obtain other advantages, it would be well to consider the question a little before deciding against these units being altered. If we retain the pound as the Decimal unit, we must abandon the ton, cwt., quarter, stone, ounce, dram; Troy pound, ounce, pennyweight, grain, the dram and scruple; the minim, fluid dram, ounce. The pint, peck, bushel, quarter, &c., must be altered if we retain the gallon. Here we have an alteration or abandonment of at least twenty units, and in altering so much why not alter a little more if we can thereby gain an advantage? Why not alter twenty-two instead of only twenty? If we retain the pound, butchers may still continue to use the stone of eight pounds; but if we alter the pound a little they would then take to the ten pound stone, and other stones would be abandoned also. Wool weight for instance would have to be abandoned altogether. Could anything be more barbarous than the following?—

			cwt.	qrs.	lbs.
14 pounds	1 stone	=	0	0	14
2 stone	1 tod	=	0	1	0
6½ tods	1 wey	=	1	2	14
2 weys	1 sack	=	3	1	0
12 sack	1 last	=	39	0	0
240 pounds	1 pack	=	2	0	16

If we retain the present pound, and make 10 pounds 1 stone, 10 stones 1 quintal, 10 quintals 1 little ton, such little ton will be so far removed from any weights we have at present as to give us no idea of old tons when new ones are named; the little ton would be less than 9 cwt. The tonnage of a ship, or the weight of the Britannia-bridge, expressed in the new tonnage, would give no adequate idea to our minds. 18 cwt. new would be 1800 pounds—only 16·07 cwt. old; but if we make the new pound so that 100

of them would be somewhere about equal to 112 lbs. old, and make our gallon to be equal to 10 lbs of water, as at present, we may derive several advantages of no small magnitude. We may take advantage of so much change, and make the gallon in reality what it should be, viz., a measure of volume. The capacity of the present gallon multiplied by $\frac{112}{100}$ would be in cubic tys 179·714528239827497 nearly. Let us now agree that 180 cubic tys shall be a gallon, instead of 277·274 cubic inches; in finding the contents of a cistern we shall then have to divide its volume in tys by 180 instead of 277·274 as at present. Such a gallon measure would be easily made: 5 tys long, 4 tys wide, and 9 tys deep, would give a gallon *exactly*. Anybody might then construct a gallon measure. The tank maker and carpenter could easily remember that the bottom of a gallon would be 5 and 4; and its depth as much as its length and breadth, or 9; and that to find the contents of a tank or cistern, divide by 5, 4, and 9 added together. 5 × 5 × 7·2 would offer extraordinary facility for making a standard gallon.

The fluid pound or new pint, the fluid ounce, the 10 gallon or new bushel, could all easily be found from the simple divisions on the Decimal foot, thus:—

1 × 1 × 1·8 = fluid ounce $\frac{1}{100}$ gallon.
1 × ·9 × 2 = " "
3 × 3 × 2 = pint $\frac{1}{10}$ gallon.
4 × 2 × 4·5 = " "
2 × 4 × 1·5 = " "
5 × 5 × 7·2 = gallon.
5 × 4 × 9 = "
6 × 6 × 5 = "
10 × 10 × 18 = bushel = 10 gallons.
10 × 12 × 15 = " "
12 × 12 × 12·5 = " "
15 × 15 × 8 = " "

Other dimensions equally simple might easily be found;

and these dimensions would give the new weights. A box 3 × 3 × 2 filled with water would give the new pound weight; 1 × ·9 × 2 would give the new ounce weight; and 5 × 4 × 9 the new stone. 100 of these new pounds would be equal to the present cwt., within less than the fifth part of a pound. This might be called a quintal; 10 of these quintals might be called a little ton, or litton; the number of littons halved would give the number of tons very nearly; 1000 littons would be equal to 500·08 tons; the tenth of the new gallon would be nearer to the present pint than the tenth of the old one; the new grain and the new minim would also be nearer from such a division, than by dividing the present pound and gallon. And all these important advantages can be obtained by altering 22 of our present units, instead of altering only 20 of them. If we take a moral view of the subject, we can easily see that there could not be so much fraud, where a mechanic could so easily make himself a measure if he suspected short measure of his milk or beer.

The most effectual way to upset the present incongruous multiples and sub-divisions of the pound and gallon, will be to upset the pound and gallon themselves. The Act of Parliament makes it illegal to sell by any other stone than that of 14 lbs., yet the Smithfield salesmen use one of 8 lbs., excusing themselves by saying that they do not sell by the stone but by the pound, and it is as legal to sell 8 lbs. as any other quantity. Corn dealers will continue to use the quarter of 64 gallons instead of 100, if the present gallon remain to them, but change the basis and all must follow; and at a trifling inconvenience to ourselves we shall be able to bequeath to our children a system which, if not perfect, will save them from an incalculable amount of labour, inconvenience, and expense.

An immense amount of business is at present done by the cwt.: the method proposed would make quite an immaterial difference in this most important unit, being only about two ounces *new* more than the present 112 lbs. If this question were left to be decided by commercial men, they would very likely prefer changing the pound to changing the cwt. on this account alone; and if corn merchants and farmers are to be compelled to change their quarter, we can give them in return a very simple method of computing the quantities which they deal in.

For instance, to find how many quarters of grain are in a warehouse: multiply the length, breadth, and depth in feet into one sum, and divide by 18 for answer. For bushels, divide by 1·8; and for gallons, divide by ·18.

EXAMPLE.—A granary floor is 84·6 feet long, 32·4 feet wide, and covered with grain to the depth of 2·6 feet, how many Victorian quarters of corn are there?

```
        846
        324
       ----
       3384
      1692
     2538
     ------
     274104
         26
    -------
    1644624
    548208
   --------
18)7126.704(395·92 = 395 qrs., 9 bush., 2 galls.
   54
   ---
   172
   162
    ---
    106
     90
     ---
     167
     162
      ---
       50
```

A cistern 8·6 feet long, 2·9 feet wide, and 4·5 feet deep: how many Victorian gallons will it hold, and what will be the weight in Victorian pounds?

```
          8·6
          2·9
         ----
          774
         172
         ----
        24·94
          4·5
        -----
        12470
        9976
       ------
  ·18)112·230(623·5 gallons = 6235 pounds.
      108
      ---
        42
        36
        --
         63
         54
         --
          90
          90
```

A granary floor, 60 feet long, 40 feet wide: how deep will 465 Victorian quarters of wheat cover it?

```
            465
             18
           ----
     60    3720
     40    465
    -----------
   2400)8370(3·44 answer.
         72
        ---
        117
         96
        ---
        110
```

To find accurately the contents, in gallons or pounds, of a cistern of pure water, the dimensions being given in feet, it is necessary to multiply by $\frac{436247424}{7000000000}$. *No simpler method can be found*, if we retain the present pound and gallon. By the proposed system we can, from a table of specific gravities,

find the weight of any substance given in it, by simply multiplying its specific gravity by $\frac{5}{90}$. Example: The specific gravity of cast iron is 7048; what will be the weight of a cubic foot in Victorian pounds?

```
       7048
          5
      -----
  9,0)3524,0
      --------
      391·5555
```

For Avoirdupois pounds we multiply by $\frac{436247424}{7000000000}$. A cubic foot of water in the *new* system would weigh half a quintal, half a stone, half a pound, half an ounce, half a dram, half a scruple, half a grain; or, 5 stone, 5 pounds, 5 ounces, 5 drams, 5 scruples, 5 grains, $\frac{5}{10}$ of a grain, $\frac{5}{100}$ of a grain, $\frac{5}{1000}$ of a grain, and so on, *ad infinitum*, because ·18 of a cubic foot would weigh 10 lbs., and 1·8 would weigh 100 lbs., and 18 cubic feet would weigh 1000 lbs. Therefore we should have the following analogy:—

$$18 : 1000 :: 1 : \frac{1000}{18} = \frac{500}{9} = 55{\cdot}55555 = 55\tfrac{5}{9}$$

By decimally dividing the foot we should lose the inches of the Barometer, which perhaps ought not to be regretted, as they never accurately represented half pounds of pressure. The atmosphere is taken by engineers at 15 lbs. as a round number, instead of 14·7, giving an error of $\frac{3}{10}$ In the new system 14·7 would be represented by 13·125, and by taking 13 as a round number we should err only $\frac{1}{8}$ instead of $\frac{3}{10}$.

The nominal horse-power of a steam-engine is found by multiplying the area of the piston into its velocity per minute, and by $\frac{7}{33000}$. If the inch were abolished, and the area given in square tys, we would have to use $\frac{1008}{33000}$, and as 33,000lbs. would be represented by 29,417 Victorian pounds, we would have $\frac{1008}{29417}$, as the fraction to be used.

Parliament has not yet dealt with the unit of power, but in the event of any change being effected in our weights and measures, it would become necessary to provide a statute horse-power, and, as pressures have much increased since Watt fixed his unit, advantage might be taken of the change to make the nominal approximate more to the real horse-power. In good modern engines we may take the real to the nominal as three to one. Let, then, the nominal or commercial pressure be taken at 30lbs. per square ty, instead of 10·08lbs., and let 30,000 Victorian pounds raised one foot per minute, be declared a statute horse-power. We would then have $\frac{1}{1000}$ instead of $\frac{7}{33000}$ for nominal horse-power, and $\frac{p}{30000}$ instead of $\frac{p}{33000}$ for real horse-power. The new real horse-power would differ by less than a sixtieth of the whole, and the nominal and real would be much nearer, and the calculation much simpler. A few other things would, of course, have to be adjusted to the new system, but no very great and lasting inconvenience could arise from doing so, while the advantages would be real and enduring.

By the fourth clause of the Act of 17th June, 1824, a brass weight, "in the custody of the clerk of the House of Commons," was declared to be equal to 5760 grains, and should be a Troy pound, and that "7000 such grains shall be, and they are hereby declared to be, a pound Avoirdupois." Here we have an identity between the Troy and Avoirdupois grains. By the fifth clause a cubic inch of distilled water, weighed in air with brass weights, at 62° Fahrenheit, barometer 30 inches, is declared to be equal to 252·458 such grains. A cubic foot of water under similar circumstances will therefore weigh 62·32106057$\frac{1}{7}$ lbs. = 436,247·424 grains. If this be taken as the standard of weight and capacity, we shall have as follows:—

WEIGHTS.

NEW.	OLD.
1 Millet .... =	·436 grain.
1 Scruple ... =	4·362 grains.
1 Dram .... =	·727 dram.
1 Ounce .... =	·997 ounce.
1 Pound .... =	9·971 ounce.

NEW.	OLD.
1 Stone.... =	6·232 lbs.
1 QUINTAL.. =	62·321 lbs.
1 Litton ... =	5·564 cwt.
1 Gretton.. =	55·644 cwt.

MEASURES OF CAPACITY.

NEW.	OLD.
1 Minim...... =	·19 minim.
1 Fluid Scruple =	1·92 minim.
1 „ Dram .. =	·32 fluid dram
1 „ Ounce . =	·25 „ oz.
1 Pint........ =	·5 pint.
1 Gallon...... =	·63 gallon.

NEW	OLD.
1 BUSHEL .. =	·79 bushel.
1 Firkin .. =	·68 firkin.
1 Quarter.. =	·97 quarter.
1 Puncheon =	·87 puncheon
1 Load ...... =	1·93 load.

These tables are for a cubic foot, decimally divided and multiplied. A minim would be ·001 of a cubic ty, and a load 100 cubic feet; a millet would be the weight of ·001 of a cubic ty of water, and a great ton or gretton, the weight of 100 cubic feet of water.

After the lapse of some years this would be a most admirable system, but would entail a great amount of inconvenience in the change from the present. Of all the old units, the quarter would be the only one to come near the new ones amongst the measures, and the ounce would be the only one amongst the weights. The same figures which express the specific gravities of bodies would then express their weights; and the number of gallons, bushels, quarters, or pounds of water contained within given dimensions, would then require no divisor. The specific gravity of wrought iron being 7700, the weight of a cubic foot would be 770 pounds, and a cubic ty would be ·77 lbs.

STANDARDS OF LENGTH, CAPACITY, AND WEIGHT.

We have no standard of length: we never have had a standard of length. In the *Athenæum* of Oct. 22, 1853, we read as follows:—

"After an infinite number of experiments and comparisons, two "standards have been constructed. The originals have been enclosed "in one of the walls of the New Houses of Parliament;—and perfectly "accurate copies were placed by Mr. Airy in the custody of the Royal "Society on Thursday last.

"The standard-yard measure is defined by the interval between two "lines upon a bar of gun-metal. The bar is about 38 inches long and "1 inch square; it is supported in a horizontal position upon eight "brass rollers, which are carried by levers so arranged that the "pressures upon the eight rollers are necessarily equal. The "lever frame, with the bar resting upon it, is placed in a box of "mahogany wood. The bar is prevented from moving endways "by weak brass springs attached inside to the ends of the box, "and is prevented from moving upwards by wedges of paper placed "under three inverted stirrups. Near to each end of the bar, a "cylindrical hole is sunk from the upper surface of the bar to the "depth of half an inch, and at the bottom of each cylindrical hole "is inserted a gold pin, upon which are cut three fine lines in the "direction transversal to the bar, and two fine lines parallel to the "axis of the bar. The limiting points of the yard measure are "those points of the middle transversal lines which are midway "between the longitudinal lines. On the upper surface of the bar "the following inscription is engraved:—

"'Copper	16 oz.
"'Tin	2¼
"'Zinc	1

"'Mr. Baily's metal.

"'Standard yard at 62°·10, Fahrenheit, cast in 1845. Troughton "'and Simms, London.'

"It is necessary to observe that, although the bar was cast so long "ago as 1845, the standard yard has been completed only very lately.

"The standard pound weight is made of platinum, representing, "when weighed *in vacuo* against the last standard Troy pound, "6,999·9,975 grains,—of which the last standard contained 5,760 "grains. The form of the weight is a cylinder, with a groove "surrounding it a little above the middle of its height for the "insertion of the fork which is used in lifting it. On the upper "end of the cylinder is engraved the following inscription:—

"'No. 2. P. C.[†] 1844. 1 lb.'

"—The box containing the weight is mahogany—and when its "portions are screwed together, the weight is fixed immovably. "This mahogany box is placed in a second mahogany box, the lid "of which bears the inscription—

"'Standard Pound, 1853.'

"—The mahogany boxes of the yard and the pound are enclosed "in an oak box, upon whose lid is cut and painted the inscription—

"'British Standards of Length and Weight, 1853.'"

Notwithstanding the above, *we have no standard of length*. Give to the most expert workman that can be found, two brass or iron rods, and bid him take the utmost pains to make yard measures of them from the above-described brass bar, with its gold studs and scratches. If the thing deserve the name of standard, these two rods would be of the same length; yet there would be no difficulty whatever in making fifty, or even one hundred rods, all of different lengths, and every one longer than the shortest, and shorter than the longest of the two. If such be the case, it is literally true that we have no standard of length. We ought to have a standard: we ought to have a goodly number of copies. The parent standard ought not to be enclosed in the walls of the new Houses of Parliament, nor buried beneath the Thames Tunnel, nor sunk in the middle of the Western Ocean, nor tied to a balloon and sent to take its chance in the regions above. What a strange idea—to bury a thing in brick-work that has taken "an infinite number of experiments and comparisons" to produce! It may be found in the ruins some day, and be placed in a Museum of Antiquities to amuse future generations with the notion we had, in 1853, of making a standard. Let us hope, for our credit, that they will conclude that it was only a standard copy of what was intended to lie on a draper's counter.

[†] This means Parliamentary Copy.

A standard should have for its boundaries surfaces, not lines—something to be felt as well as seen. The sense of touch will enable us to appreciate quantities which would require to be magnified thousands of times before they could be sensible to the eye. If lines be necessary in the process of making a standard, surfaces should be brought in to finish with, and though we would not be able to say that the surface standard and the lineal standard were equal in length, we might, after our best endeavours to make them so as near as possible, declare that henceforth the surface standard should be the legal one. Then we would be able to multiply accurate copies indefinitely. Then we would be able to send a copy to each country that we have commercial relations with, to our colonies, and to our large manufacturing towns.

Such a standard as is shown in Plate 2, would be very convenient. It is there shown one-tenth the actual size for a standard foot; the upper figure being an elevation, and the lower one a plan. A gun metal cylindrical bar, one ty in diameter, the ends rounded to a radius of five tys—when rolling by its own gravity, properly guided, the standard block being tilted one sec, or $\frac{1}{100}$th of a foot, and stopping opposite the two points marked each with a fleur de lis—to be a standard foot. The two bounding surfaces of the block to be distant at one end ·9999, and at the other 1·0001, or thereabouts, of a foot. A sliding cradle to carry the bar, with a vernier working on one of the upper graduated surfaces, would enable us to ascertain the length, or approach to accuracy, to any desirable extent—to millionths of the whole. The standard block being massive, would not be liable to sudden changes of temperature, and would not be so liable to be injured by such a miscreant as he who broke the Portland vase.

All below those parts required for actual use should be enclosed in a box, and surrounded with hares'-down, or some such bad conductor of heat; and when not in use, the upper part also should be covered with a cushion stuffed with the same material, and the whole enclosed in a strong box.

Its composition should be simply copper and tin, so as to be easily imitated. Where zinc is used, you never can tell how much enters into composition, it wastes so much in mixing. Its composition and specific gravity should be marked upon it. The standard weights should *not* be of platinum. They should be as near as possible of the same specific gravity as those likely to be used; copies of them, then, might be made in the open air, and, for the sake of placing us more in unison with our French neighbours, should be determined from a given quantity of water, *in vacuo*, at its maximum density: we could then as readily compare French and English weights as measures, which is not now the case. A platinum one might be made for keeping, not being liable to oxidize.

At the present time anything is allowed to be sold as a two-feet rule. This might continue to be so, but every one sold ought to have its length, to four, five, or six decimals, stamped upon it. A great variety of machines might be designed to easily show the length to this amount of exactness, and the rules might be stamped for five mils each, which no purchaser would grudge, and a love of accuracy — a kind of honesty — cultivated thereby. An artizan would pride himself in the possession of a rule true to four or five figures. When we purchase a chronometer we receive its rate with it; and in a similar manner, when we purchase a rule we ought to be furnished with its *rate* stamped upon it.

THE FUNDAMENTAL UNIT OF LENGTH.

In Geography and Nautical Astronomy it might be convenient to have a quadrant of the terrestrial meridian decimally divided and sub-divided, in order to find an unit. In Astronomy, the earth's radius might be conveniently divided for an unit; and in Natural Philosophy, the length of the second's pendulum, or the force of gravity, might make a convenient unit; but, unquestionably, the only thing that ought to guide us should be general utility. If we had to begin *de novo*, we ought to consult the convenience of those who have to make the most frequent use of the unit of measure, and not imitate the despotic selfishness of the *liberal savans* of France, who, notwithstanding that the mechanics of France used the unit of length hundreds of thousands of times to the philosophers' once, yet took for their unit what was perhaps as inconvenient a length for the use of mechanics as could possibly be found. It is really painful to see an artizan using the French metre: it twists, bends, and wriggles about like an eel; there ought always to be two persons at least to use it properly, if such a thing admits of being properly used.

Three units of length at present prevail in the British dominions—the yard, the foot, and the link. Much might be said in favor of each being taken as the fundamental unit of length for a Decimal system of measures, and also in favor of the *two*-feet rule being taken as the unit. The yard could never be forced upon British artizans, and may therefore be dismissed *sans céremonie*. The link would be highly convenient in agricultural districts, as being already a decimal *link* in land measure. Three times its length (7·92 inches), would come very near to the two-feet rule, but its adoption would create more confusion than it relieved us of. The foot seems to leave us without any choice whatever, and it is fortunate in being of such a convenient length as to be portable without a joint, and easily handled and used. It and its tithings, or *tys*, and second divisions, or *secs*, are admirably adapted to serve nearly all the purposes of the architect, builder, and engineer. It only requires thus decimally dividing, its divisions legally naming, and the inch and yard abolishing. If a new Victorian land measure were adopted and legalized, without being compulsory in its use, the link in time would become obsolete. A Victorian chain of 100 feet, instead of the Gunter's chain of 66 feet, and a Victorian acre of 10 such square chains, or 100,000 square feet—instead of 43,560 square feet—and a Victorian mile of 10,000 feet—instead of 5,280—would completely decimalize our lineal and land measures. This might easily be done, as the old measures could all be expressed accurately in the new. A Victorian mile long and ten feet wide, would be a Victorian acre.

With respect to what may be called natural fundamental units, the adoption of one of them would be to declare that we had arrived at the *ne plus ultra* of accuracy, and we would most likely, before the unit came into general use, find out that our boasted accuracy was far from the mark, through new methods or instruments being invented. The utmost pains ought to be taken to ascertain the relation, as near as possible, between our unit and the length of a seconds' pendulum—not with the object of being enabled to renew the standard when lost, for this ought to be avoided by having a sufficient number of accurate copies distributed over the earth's surface, but for the purposes of mechanical science. Renewing a lost standard from the seconds' pendulum, is a task exceedingly difficult and troublesome, and *only an approximation after all.*

The Anglo-Saxon family of man is extending itself over an immense expanse of the earth's surface, and wherever it goes the English foot-rule goes with it. The foot-rule is always in use; the sun is always shining upon it: never was instrument before of such extensive use. Let it therefore be adopted as the fundamental unit of length, and when the time comes for the final struggle between it and the French metre, the latter foolish thing will vanish before it like snow beneath the sun.

If its cube of water were made an unit of volume, measure, and weight, we should have all that could be desired. This is perhaps too much to expect at present; we must therefore content ourselves with something less perfect, but much more convenient for the present generation.

NOMENCLATURE.

WITH respect to the names of the new coins, it is now too late to think of any others than those proposed by the Committee, even if it were desirable. They had only two coins to name, and they had the good sense to choose monosyllables for them. But in the event of a Decimal system of weights and measures being adopted, it is well to take a common sense view of the subject in good time. There are people who seem to think that a Decimal system is in some way or other dependent upon the names we may give to the unit. With them, a Decimal system means, taking a fundamental unit, and expressing its multiples and sub-multiples by the same unit, with a Greek or Latin prefix; and they would inflict upon us decifoot and decafoot—decipound and decapound—kilogallon and centigallon. In primitive times when men got new ideas, they invented new sounds or names for those ideas—generally, simple monosyllables—but, now-a-days, we must go thousands of miles away, and thousands of years back, to find a people to stand sponsors for our new things. Surely it is not inconsistent with common sense that in adopting a system of Decimal weights and measures, we should retain the old names as much as possible, or coin new ones that should be easy to write, to pronounce, and hear and distinguish from other words used along with them. We want things to be known by their names, not by their definitions. Define an inch to be one-twelfth of a foot, if you please, but do not call it a duodecifoot. Shopkeepers have not been always obliged to refer to a book to know how many ounces went to the pound, although the ounce had not a name which expressed, in a language unknown to most of them, its relation to the pound. Let every unit we use have a distinct name of its own: no tenths or hundredths, but let the smallest divisions be furnished with a name. They could not be worse for being derived, and they could be very little better for it. There are yet an abundance of good, well-sounding monosyllables unappropriated, and let common sense prevail over pedantry for once—it has laid prostrate before its all-conquering rival quite long enough. In household and counting-household words, let us at least eschew Greek and Latin.

EXTRACT from the Act passed 17th June, 1824, to come into operation May 1st, 1825;—

"And whereas it has been ascertained by the Commissioners appointed by His Majesty to inquire into the subject of Weights and Measures, that the said yard hereby declared to be the Imperial Standard Yard, when compared with a pendulum vibrating seconds of mean time in the latitude of London, in a vacuum at the level of the sea, is in the proportion of thirty-six inches to thirty-nine inches, and one thousand three hundred and ninety-three ten-thousandth parts of an inch."

"And whereas it is expedient that the said Standard Troy Pound, if lost, destroyed, defaced, or otherwise injured, should be restored of the same weight, by reference to some invariable natural standard; and whereas it has been ascertained, by the Commissioners appointed by His Majesty to inquire into the subjects of Weights and Measures, that a cubic inch of distilled water, weighed in air by brass weights, at the temperature of sixty-two degrees of Fahrenheit's thermometer, the barometer being at thirty inches, is equal to two hundred and fifty-two grains and four hundred and fifty-eight thousandth parts of a grain, of which, as aforesaid, the Imperial Standard Troy Pound contains five thousand seven hundred and sixty."

"And be it further enacted, That from and after the first day of May, one thousand eight hundred and twenty-five, the Standard Measure of Capacity, as well for liquids as for dry goods not measured by heaped measure, shall be the Gallon, containing ten pounds Avoirdupois weight of distilled water weighed in air, at the temperature of sixty-two degrees of Fahrenheit's thermometer, the barometer being at thirty inches."

TABLE showing the effect produced on the Bank of England's transactions with the Mint by Decimalizing the coinage, and also by Decimalizing the Avoirdupois pound, and the new Victorian pound, in combination with the new coinage.

	Troy oz.	Avoir. oz.	Victorian oz
Mint price of gold	3.89375	5·67839	6·36989
Bank price of gold	3·8875	5·66927	6.35967
Nearest Mint price without fractions of a mill	3·894	5·678	6·370
Fractions of a mill difference	·25 more	·39 less	·11 more
Nearest Bank price without fractions of a mil	3·888	5·669	6.360
Fractions of a mil difference	·5 more	.27 less	·33 more
Bank profit in mils	6	9	10
New profit of Bank, instead of £100 as at present	96·000	98·743	97·561
Difference in mils the Mint will have to pay per £100	6 more.	7 less	2 more
Mint price per dram, $\frac{1}{100}$ lb. mils.	389·4	567·8	637
Bank " " "	388·8	566·9	636
Difference	.6	·9	1
Sum of Bank and Mint errors	·75	·66	·44

A Troy pound of silver is coined into 33 florins at present. After the same rate, an Avoirdupois pound would be coined into 40·1041666, and a Victorian pound would be coined into 44·987989. If these were made into round numbers, we should have 40 in the one case and 45 in the other. The error arising from the Avoirdupois pound would be ·1042, and from the Victorian only ·012:—the former a loss to the Mint, and the latter a gain.

SCHEDULE FOR TOLLS.

Toll	LOW RATE.			HIGH RATE.			Loss per cent.	Gain per cent.	Yearly loss.	Yearly gain.	DIFFERENCE.	
Pence.	Months.	Days.	Mils.	Months.	Days.	Mils.					Loss.	Gain.
½	11	334	2	1	31	3	4	44	1336	1364	0	28
1	10	304	4	2	61	5	4	20	1216	1220	0	4
1½	9	273	6	3	93	7	4	12	1092	1116	0	23
2	8	243	8	4	123	9	4	8	972	984	0	12
2½	7	212	10	5	154	11	4	5·6	848	862	0	14
3	6	181	12	6	185	13	4	4	724	740	0	16
3½	5	151	14	7	215	15	4	2·857	604	614	0	10
4	4	120	16	8	246	17	4	2	480	492	0	12
4½	3	90	18	9	276	19	4	1·333	360	368	0	8
5	2	59	20	10	307	21	4	0·8	236	241	0	5
5½	1	31	22	11	335	23	4	0.362	124	121	3	0
		1998			2026						3	132
		2026										3
												129

£402,400 yearly receipts, at £100 per day for each rate of toll.

402,400 : 129 : : 100 : ·032, or 32 mils per cent.

Toll	HIGH RATE.			LOW RATE.			Gain per cent.	Loss per cent	Yearly gain.	Yearly loss.	DIFFERENCE.	
Pence.	Months.	Days.	Mils.	Months.	Days.	Mils.					Gain.	Loss.
½	1	31	3	11	334	2	44	4	1364	1336	28	0
1	2	61	5	10	304	4	20	4	1220	1216	4	0
1½	3	93	7	9	273	6	12	4	1116	1092	24	0
2	4	123	9	8	243	8	8	4	984	972	0	8
2½	5	154	11	7	212	10	5·6	4	862	848	14	0
3	6	185	13	6	181	12	4	4	740	724	16	0
3½	7	215	15	5	151	14	2·857	4	614	604	10	0
4	8	246	17	4	120	16	2	4	492	480	12	0
4½	9	276	19	3	90	18	1·333	4	368	360	8	0
5	10	307	21	2	59	20	0·8	4	245	236	9	0
5½	11	335	23	1	31	22	0·362	4	120	124	0	4
		2026			1998						125	12
		1998									12	
									111		113	

£402,400 = yearly receipts at £100 per day for each toll.

402,400 : 113 : : 100 : ·028, or 28 mils per cent.

USEFUL CONSTANTS IN RELATION TO ENGLISH, VICTORIAN, & FRENCH WEIGHTS & MEASURES.

Gallons	×	277·273844	give	cubic inches	2·44290890265
Gallons	×	4·54345797	„	litres	0·65738650160
Gallons Victorian	×	5·09675328	„	litres	0·70729384219
Litres	×	0·22009687	„	gallons Imperial .	9·34261349840
Litres	×	0·19620351	„	gallons Victorian .	0·29270615781
Litres	×	35·31663167	„	cubic tys........	1·54797866291
Steres	×	„	„	cubic feet	„
Cubic tys	×	0·02831535	„	litres	8·45202133709
Cubic feet......	×	„	„	steres	„
Metres	×	3·2808992	„	feet	0·51599288764
Feet	×	0·30479449	„	metres..........	9·48400711236
Metres	×	3·078444	„	pieds	0·48833125774
Pieds	×	0·3248394	„	metres..........	9·51166874226
Pieds	×	1·06576543	„	feet	0·02766162989
Feet	×	0·93829277	„	pieds	9·97233837011
Ares	×	1076·42996	„	square feet	3·03198577527
Square feet	×	0·000929	„	ares	6·96801422473
Ares	×	0·02471143	„	acres	8·39289590419
Acres	×	40·4671037	„	ares	1·60710409581
Grammes	×	15·438	„	grains	1·18859103659
Grains	×	0·06477523	„	grammes........	8·81140896341
Kilogrammes ..	×	2·20542857	„	pounds	0·34349299658
Pounds	×	0·45342661	„	kilogrammes	9·65650700342
Pounds Victorian	×	0·40420334	„	kilogrammes	9·60659990783
Kilogrammes ..	×	2·47400226	„	Victorian pounds.	0·39340009217
Victorian pounds	×	1·12177846	„	old pounds......	0·04990685058
Victorian gallons.	×	„	„	Imperial gallons .	„
Old pounds	×	0·8914417	„	Victorian pounds .	9·95009314942
Imperial gallons.	×	„	„	Victorian gallons .	„
Victorian quintals	×	1·00158791	„	old cwts........	0·00068907292
Old cwts.	×	0·99841461	„	Victorian quintals	9·99931092708
Cubic inches	×	252·458	„	grains	2·40218913736
Weight of a cubic foot of water in old pounds..................		62·32106057$\frac{1}{7}$		..	1·79463483549
Weight of a cubic foot of water in Victorian pounds		55$\frac{5}{9}$		....	1·74472749490

APPENDIX

OF

USEFUL INFORMATION

RELATIVE TO

Present Weights, Measures, &c.

A SYNOPTICAL TABLE OF OLD AND NEW FRENCH, AND THE PRESENT ENGLISH MEASURES OF LENGTH.

Sec.	0·96	0·12	0·1125951	0·1	0·0151515	0·01	0·00938293	0·00333333	0·0030479449	0·001666667	0·001563665	0·0001515152	0·00000189394
1·0416667	Eighth.	0·125	0·1172866	·010416667	0·0157828	0·01041667	0·01006913	0·00347222	0·00317494	0 001736111	0·001628959	0·000157828	0·000001972853
8·3333333	8	Inch.	0·9382928	0·8333333	0·12626263	0.0833333	0·0781914	0·02777778	0·02539954	0·01388889	0·01303184	0·001266667	0·0000157828
8·8813811	8·5261234568	1·0657654321	Pouce	0·888138	0·13456634	0 0888138	0·0833333	0·0296046	0·02706996	0·0148023	0·08333333	0·00134566	0·000016782
10	9·6	1·2	1·1259513	Ty.	0·1515152	0·1	0·0938289	0·03333333	0·03047945	0·01666667	0·01563665	0 001515152	0·0000189394
66	63·36	7·92	7·4312788	6·6	Link.	·66	0·062005	0·22	0 201114	0·11	0·1033416	0·01	0 000125
100	96	12	11·2595133	10	1·5151515	Foot.	0·9382928	0 3333333	0·3047945	0·1666667	0·1563665	0·015·15152	0 000189394
106·57654321	99·3134815	12·7891852	12	10·657654321	1·6127737	1·0657654321	Pied.	0·35525515	0·32485	0·1776278	0·1666667	0.01614797	0·00020185
300	288	36	33·7785399	30	4·5454545	3	2·8148783	Yard.	0·9143856	0 5	0·4691485	0·04545455	0·00568182
328 0815833	314·96632	39·37079	36 941328	32·808992	4·9723093	3·2808992	3·078444	1·093633	Metre.	0 5468165	0·513074	0·0497106	0·00062138
600	576	72	67·5570798	60	9·0909091	6	5·6297566	2	1·82876696	Fathom.	0·938297	0·090909091	0·001136364
639 4592593	613·8808889	76·7351111	72	63 9459259	9·676642	6·3945926	6	2·1315309	1 949036591	1·0657654321	Toise.	0 0269133	0·00121091
6600	6336	792	743·1278776	660	100	66	61·92732313	22	20·1164366	11	10·3212205	Chain.	0·0125
528000	506880	63360	59450·130205	52800	8000	5280	4954·18585	1760	1609·3149	880	825·6976417	80	Mile.

WEIGHTS AND MEASURES.

AVOIRDUPOIS WEIGHT.

$27\frac{11}{32}$	Grains	= 1	Dram	= $27\frac{11}{32}$	grains.
16	Drams	= 1	Ounce	= 437½	
16	Ounces	= 1	Pound (lb.)	= 7000	
14	Pounds	= 1	Stone.		
28	Pounds	= 1	Quarter (qr.)		
4	Quarter	= 1	Hundredweight (cwt.)		
20	Cwt.	= 1	Ton.		

PARTICULAR WEIGHTS.

				cwt.	qr.	lb.	
8	Pounds	= 1	Stone.				Used for Meat.
14	Pounds	= 1	Stone	= 0	0	14	Used in the Wool Trade.
2	Stone	= 1	Tod	= 0	1	0	
6½	Tods	= 1	Wey	= 1	2	14	
2	Weys	= 1	Sack	= 3	1	0	
12	Sacks	= 1	Last	= 39	0	0	

TROY WEIGHT.

24	Grains	= 1	Pennyweight	= 24	grains.
20	Pennyweights	= 1	Ounce	= 480	,,
12	Ounces	= 1	Pound	= 5760	,,

These are the denominations of Troy Weight.

APOTHECARIES' WEIGHT.

				Troy.	
20	Grains	make 1	Scruple	= 23	grains.
3	Scruples	1	Drachm	= 60	,,
8	Drachms	1	Ounce	= 480	,,
12	Ounces	1	Pound	= 5760	,,

This weight is only established by custom, and not by any Act of Parliament.

Apothecaries compound their medicines by this weight, but buy and sell their drugs by avoirdupois.

The pound and ounce of the apothecaries' weight are equal to those of troy weight, only differently divided and subdivided.

APOTHECARIES' FLUID MEASURE.

				Marked.
60	Minims ♏	make 1	Fluid Drachm	ʒ
8	Drachms	1	Ounce	℥
20	Ounces	1	Pint	O
8	Pints	1	Gallon	gall.

HAY AND STRAW WEIGHTS.

36 lb.	Avoirdupois of Straw	make 1	Truss.
56 lb.	,, of Old Hay	1	,,
60 lb.	,, of New Hay	1	,,
36	Trusses	1	Load.

Hay is called old after the commencement of September. A load of old hay weighs 18 cwt., and a load of new hay 19 cwt. 32 lbs. A load of straw weighs 11 cwt. 64 lbs.

LINEAL MEASURE.

12	Inches	= 1	Foot (ft.)
3	Feet	= 1	Yard (yd.)
5½	Yards	= 1	Rod, or Pole (po.)
40	Poles or 220 Yards	= 1	Furlong.
8	Furlongs, or 1760 Yards	= 1	Mile.

$\frac{1}{12}$	Inch	makes 1	Line	
⅓	Inch	1	Barleycorn	
3	Inches	make 1	Palm	
4	Inches	1	Hand	hd.
$7\frac{23}{25}$	or 7·92 Inches	1	Link	lk.
9	Inches	1	Span	
18	Inches	1	Cubit	
½	Feet	1	Pace	pace
5	Feet (a geometrical)	1	Pace	pace
6	Feet	1	Fathom	fath.
5½	Yards	1	Rod, Pole, or Perch	rod, p.
4	Poles or 22 yards	1	Chain	ch.
3	Miles	1	League	lea.
60	Geographical miles, or 69½ English miles	1	Degree	deg. or °
360	Degrees		The circumferance of the Globe, or any Circle	

CLOTH MEASURE.

This measure is used for all kinds of cloth, muslin, ribbon, &c.

The yard in Cloth Measure is the same as in Long Measure, but differs in its divisions and subdivisions.

2¼	Inches	make 1	Nail	nl.
4	Nails	1	Quarter	qr.
4	Quarters	1	Yard	yd.
3	Quarters	1	Flemish ell	Fl. ell
5	Quarters	1	English ell	Eng. ell
6	Quarters	1	French ell	Fr. ell

LAND MEASURE.

Land is measured by a chain, called Gunter's Chain. It is 4 poles, or 22 yards long, and consists of 100 equal links, each $7\frac{23}{25}$ inches in length.

Ten chains in length and 1 in breadth, or 100,000 links, make an acre.

144	Square Inches	= 1	Square Foot.
9	Square Feet	= 1	Square Yard
30¼	Square Yards	= 1	Perch, or Rod
40	Perches	= 1	Rood
4	Roods	= 1	Acre
640	Acres	= 1	Square Mile
30	Acres	= 1	Yard of Land
100	Acres	= 1	Hide of Land
40	Hides	= 1	Barony

LIQUID MEASURE.

				Marked.		Cubic Inches nearly.
4 Gills	....	1 Pint......		pt.	=	$34\frac{2}{3}$
2 Pints	....	1 Quart		qt.	=	$69\frac{1}{3}$
4 Quarts	....	1 Gallon	..	gal.	=	$277\frac{1}{4}$

Imperial Measure					Old Measure, for Wine, Spirits, &c.		
gal.	qt	pt.	gills.		gallons.		
8	1	0	2·58	=	10	........make	1 Anker
14	3	1	3·87	=	18	....	1 Rundlet
34	3	1	3·70	=	4	....	1 Tierce
52	1	1	3·55	=	63	....	1 Hogshead
69	3	1	3·40	=	84	or 2 Tierces..	1 Puncheon
104	8	1	3·11	=	126	or 2 Hhds. ..	1 Pipe or Butt
109	3	1	2·22	=	252	or 2 Pipes ..	1 Tun

Imperial Measure					Old Measure, for Ale and Beer.		
gal.	qt.	pt.	gills.		gallons.		
9	0	1	0·91	=	9	........make	1 Firkin
18	1	0	1·83	=	18	....	1 Kilderkin
36	2	0	3·64	=	36	....	1 Barrel
54	3	1	1·45	=	54	....	1 Hogshead
					108	or 2 Hhds. ..	1 Butt
					216	or 2 Butts....	1 Tun

DRY MEASURE.

2 Gallons......	1 Peck	......	pk.	=	$554\frac{1}{2}$	Cubic in. nearly.
4 Pecks........	1 Bushel....		bush.	=	$2281\frac{1}{5}$	
3 Bushels	1 Sack	....		=	$4\frac{8}{9}$	Cubic ft. nearly.
12 Sacks	1 Chaldron	......		=	$58\frac{2}{3}$	
8 Bushels	1 Quarter	......	qr.	=	$10\frac{1}{4}$	
5 Bushels	1 Load	....	ld.	=	$51\frac{1}{3}$	

COMMERCIAL NUMBERS.

12 Articles ..	1 Dozen	24 Shts. Paper	1 Quire
13 Ditto	1 Long Dozen	20 Ditto	1 Do. outsides
12 Dozen ..	1 Gross	25 Ditto	1 Printer's ditto
20 Articles ..	1 Score	20 Quires	1 Ream
5 Score	1 Common hundred	$21\frac{1}{2}$ Ditto	1 Printer's ditto
		2 Reams....	1 Bundle
6 Score	1 Great hundred	10 Ditto	1 Bale
80 Deals	1 Quarter		
4 Quarters ..	1 Hundred	5 Doz. Skins of Parchment	1 Roll

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Double Elephant	0	40	,,	0	26	Super Royal	0	27	,,	0	19
Atlas	0	33	,,	0	26	Royal	0	24	,,	0	19
Columbier	0	34	,,	0	23	Medium	0	22	,,	0	17
Elephant	0	27	,,	0	23	Demy	0	20	,,	0	15

A CATALOGUE OF USEFUL THINGS.

A dicker of hides, 10 skins.
Ditto of gloves, 10 dozen pair.
A last of hides, 20 dickers
A chaldron of coals, 36 bushels
Standard gallon contains 10 lb. avoirdupois of distilled water.
A weigh of cheese, 236 lb.
The hundredweight is 112 lbs.
A stone of fish, 14 lb., and of wool, 14 lbs. The same for horseman's weight, hay, iron, shot, &c.
A stone of glass, 5 lbs., and a seam of ditto, 24 stone.
A cade of red herrings, 500, and sprats, 1000.
A load of timber unhewn, 40 cubic feet.
A pocket of hops, average weight about $1\frac{1}{2}$ cwt. to 2 cwt.
A bag of hops, nearly $3\frac{1}{2}$ cwt.
A ton contains 42 cubic feet.
A butt of sherry, 108 galls.

Flour, peck or stone....	lb.	14
,, boll of 10 pecks or stones		140
,, sack of 2 bolls		280
,, barrel		196

1 hogshead of claret, 45 gallons.
8 pints, dry or liquid measure, a gallon.
8 gallons, a bushel of corn.
8 bushels of corn, a quarter.
A last of corn or rape-seed, 10 quarters, or 80 bushels.
Ditto of potash, cod-fish, white herrings, meal, pitch, and tar, 12 barrels.
Ditto of flax and feathers, 17 cwt.; of gunpowder, 24 barrels, or 2400 lbs.; of wool, 4568 lbs.
A tun of wine, 252 gallons; oil of Greenland, ditto.
A ton in weight is 20 cwt. of iron, &c., but in lead there is but $19\frac{1}{2}$ cwt., called a fodder, which is 2184 lbs.
A tod of wool is 28 pounds.
A pack of ditto, 240 pounds.
4 lbs. Avoirdupois is equal to 5 lbs. Troy nearly.
A firkin of butter, 56 lbs.
A pipe, 115 gallons.
A quintal or kintal, 1 cwt.
A load of bricks, 500; and plain tiles, 1000.
8 pounds, 1 stone of meat.

COINS.

GOLD COIN.

The Standard for Gold.—Gold is considered the standard metal; and there is no alteration either in weight or fineness, from former coinages; $934\frac{1}{2}$ sovereigns weigh exactly 20 lbs. Troy. The real weight of the sovereign is 5 dwts. 3·274 grs., and that of the half-sovereign, 2 dwts. 13·637 grs. The standard for gold coin is a mixture of 11 parts of fine gold and 1 of alloy, 1 lb. Troy of which is coined into 46 sovereigns and $\frac{89}{120}$ of another. The value of 1 lb. of gold is $46\frac{29}{40}$ sovereigns, or £46 14s. 6d., or £3 17s. $10\frac{1}{2}$d. per ounce.

SILVER COIN.

The silver coins are also of the old standard fineness, of 11 oz. 2 dwts. of pure silver to 18 dwts. of alloy; but 1 lb. Troy of this standard is now coined into 66s. instead of 62s. as was formerly the case. So that of this coinage—

One Shilling weighs..........	3	dwts.	$15\frac{3}{11}$ grains.
The Sixpence weighs	1	,,	$19\frac{7}{11}$,,
The Fourpence weighs........	1	,,	$5\frac{1}{11}$,,
The Crown weighs	18	,,	$4\frac{4}{11}$,,
The Half-crown weighs	9	,,	$2\frac{2}{11}$,,

The standard for silver coin is 11 ounces 2 pennyweights, and 18 pennyweights of alloy, making the pound Troy.

The standard for gold is two carats of alloy to 22 of fine gold, making a pound Troy. Alloy of gold is silver and copper, and of silver is copper.

LOGARITHMS.

As an illustration of the simplicity with which calculations may be effected by means of Logarithms, take the following :—

What will a penny amount to, from the commencement of the Christian era to the present year (1854), at compound interest, at 5 per cent., payable yearly?

Log. 1·05 = 0·0211893
1854
847572
1059465
1695144
211893
39·2849622
Log. 240 = 2·3802112
36·9047510

The number corresponding to this is 8,030,656,000,000,000,000,000,000,000,000,000,000.

To answer this question by ordinary arithmetic, it would be necessary to multiply 1·05 by 1·05 for 1854 times, and then divide by 240. The answer is so immensely great, that something like the following would be necessary to give us a faint idea of it.

We will take the money and construct a railroad, a penny railroad, with it, from the sun to each of the 38 planets, with branch lines to each of the satellites. The total length of all these lines may be taken at 6,250,000,000 miles. The railroad shall be on an embankment of solid gold, 100,000 miles high, and 100,000 miles wide, with a wall on each side 500 feet high and 100 feet thick, built of diamonds, each being a foot cube, and worth £233,575,750,000,000,000 sterling each brick; reckoning a diamond of one carat to be worth £2, and to increase in value as the cube of the weight.

Log. 62·321 = 1·7946348 — A
Log. 3·55 = 0·5502284 — B
Log. 2209·375 = 3·3442694 — C
Log. of carats in a cubic foot of diamonds .... } = 5·6891326
3
17·0673978
Log. 2 = 0·3010300
Log. of the value of 1 diamond brick .... } = 17·3684278

Log. 6,250, &c. = 9·7958800 — D
Log. 5280 = 3·7226339 — E
Log. = (500 × 100 × 2) = 5·0000000
Log. of the cubic feet in the walls ...... } = 18·5185139
17·3684278
Log. of the total value of the diamond walls } = 35·8869417

Log. 6,250, &c. = 9·7958800 — D
Log. 5280 = 3·7226339 — E
2. Log. (100,000 × 5280) = 17·4452678
Log. 62·321 = 1·7946348 — A
Log. 19·258 = 1·2846112 — F
Log. 7000 = 3·8450980 — G
Ar. com. log. 480 = 7·3187588 — H
Log. 3·89375 = 0·5903681 — I
Log. of the value of the gold .. } = 35·7972526

Value of the diamonds . } = £770,800,000,000,000,000,000,000,000,000,000,000*
Value of gold = 626,978,400,000,000,000,000,000,000,000,000,000†
Total value .. = £1,397,778,400,000,000,000,000,000,000,000,000,000‡
8,030,656,000,000,000,000,000,000,000,000,000,000||
Surplus .. = £6,632,877,600,000,000,000,000,000,000,000,000,000§

---

* Seven hundred and seventy thousand eight hundred quintillions.

† Six hundred and twenty-six thousand nine hundred and seventy-eight quintillions, four hundred thousand quadrillions.

‡ One sextillion, three hundred and ninety-seven thousand seven hundred and seventy-eight quintillions, four hundred thousand quadrillions.

|| Eight sextillions, thirty thousand six hundred and fifty-six quintillions.

§ Six sextillions, six hundred and thirty-two thousand eight hundred and twenty-seven quintillions, six hundred thousand quadrillions.

Leaving a remainder of more than four times the value of the raw materials, to pay engineering, law, and *Parliamentary* expenses in the various planets, &c.

A is the log. of the weight of a cubic foot of water.
B „ specific gravity of the diamond.
C „ carats in an avoirdupois pound.
D „ total distance of the planets.
E „ feet in a mile.
F „ specific gravity of gold.
G „ grains in an avoirdupois pound.
H „ grains in a troy ounce.
I „ value in pounds of a troy oz. of gold.

These simple calculations incontestibly prove, that the compound interest of one penny, at £5 per cent. per annum, payable yearly, for 1854 years, would provide capital for the raw materials of a railroad from the sun to each of the 38 planets, with branches to each of their satellites, and leave a residue of more than four times as much for engineers, lawyers, Parliamentary agents, and *bribes* to influential landowners and members of Parliament in the various planets. The railroad to be on an embankment of solid gold, 100,000 miles high, and 100,000 miles wide, with a wall of diamonds on each side, 500 feet high, and 100 feet thick, each diamond brick to be a cubic or solid foot, and equal in value to 23 solid miles of gold. A locomotive at 60 miles per hour, sound at 1125 feet, a cannon ball at 1150 feet, light at 192,000 miles, and electricity at 578,660 miles per second, would traverse the total length of line in 11,883, in 930, in 910 years, in nine, and in three hours respectively. Mathematicians will see the truth of this at a glance, and others may rest assured that we have very high authority that we are within the mark in every respect.

ENGLISH MEASURES COMPARED WITH FRENCH.

SURFACE MEASURES.

ENGLISH.	FRENCH.
Yard square	0·836097 square mètre.
Rod (square perches)	25·291939 square mètres.
Rood (1210 square yards)	10·116775 ares.
Acre (4840 square yards)	0·404671 hectare.

FRENCH.	ENGLISH.
Square mètre	1·196033 square yard.
Are	0·098845 rood.
Hectare	2·471143 acres.

The Perche of the "Waters and Forests" was 22 pieds of a side, or 484 sq. pieds. The Perche of Paris was 18 pieds of a side, or 324 sq. pieds. The Arpent of the "Waters and Forests" was 100 perches of 22 pieds. The Arpent of Paris was 100 perches of 18 pieds. It contained 32,400 sq. pieds, or 900 sq. toises, or a square of 30 toises of a side.

MEASURES OF LENGTH.

ENGLISH.	FRENCH.
Inch	2·539954 centimètres.
Foot	3·0479449 décimètres.
Yard imperial	0·91438348 mètre.
Fathom (2 yards)	1·82876696 mètre.
Pole or perch (5½ yards)	5·02911 mètres.
Furlong (220 yards)	201·16437 mètres.
Mile (1760 yards)	1609·3149 mètres.

FRENCH.	ENGLISH.
Millimètre	0·03937 inch.
Centimètre	0·393708 inch.
Decimètre	3·937079 inch.
Mètre	39·37079 inches. 3·2808992 feet. 1·093633 yard.
Myriamètre	6·2138 miles.
1 Pied or pouce	1·06576543214 foot or inch.
2 Pieds or pouces............	2·13153086428 feet or inches.
3 „ „	3·19729629642 „ „
4 „ „	4·26306172856 „ „
5 „ „	5·32882716070 „ „
6 „ „	6·39459259284 „ „
7 „ „	7·46035802498 „ „
8 „ „	8·52612345712 „ „
9 „ „	9·59188888926 „ „
10 „ „	10·65765432140 „ „
11 „ „	11·72341975354 „ „
12 „ „	12·78918518568 „ „
1 Metre	3·2808992 feet.
2 Metres	6·5617984 „
3 „	9·8426976 „
4 „	13·1235968 „
5 „	16·4044960 „
6 „	19·6853952 „
7 „	22·9662944 „
8 „	26·2471936 „
9 „	29·5280928 „
1 Toise	1·9490365912 metres. 6·39459259284 feet.

MEASURES OF CAPACITY.

ENGLISH.	FRENCH.
Pint	0·567932 litre.
Quart	1·135864 litre.
Gallon imperial	4·54345797 litres.
Peck (2 gallons)	9·0869159 litres.
Bushel (8 gallons)	36·347664 litres.
Sack (3 bushels)	1·09043 hectolitre.
Quarter (8 bushels)	2·907813 hectolitres.
Chaldron (12 sacks)	13·08516 hectolitres.

FRENCH.	ENGLISH.
Litre	1·760773 pint. 0·2200967 gallon.
Decalitre	2·2009668 gallons.
Hectolitre	22·009668 gallons.

The Setier was 12 boisseaux, of 13 litres each boisseaux.
1 Setier = 1·56 hectolitres = 4·29188526 bushels.

WEIGHTS.

These are not quite exact.

ENGLISH. TROY.	FRENCH.
Grain	0·065 gramme.
Pennyweight	1·555 gramme.
Ounce	31·091 grammes.
Pound Troy imperial	0·373096 kilogramme.

ENGLISH. AVOIRDUPOIS.	FRENCH.
Dram	1·771 gramme.
Ounce	28·338 grammes.
Pound Avoirdupois	0·4534 kilogramme.
Cwt.	50·78 kilogrammes.
Ton	1015·65 kilogrammes.

FAENCH.	ENGLISH.
Gramme	15·438 grains troy. 0·643 pennyweight. 0·0322 ounce troy.
Kilogramme	2·6803 pounds troy. 2·2055 pounds Avoirdupois.

1 Livre of 9216 French grains = 0·489505847 kilogrammes = 1·07863353993 pounds.

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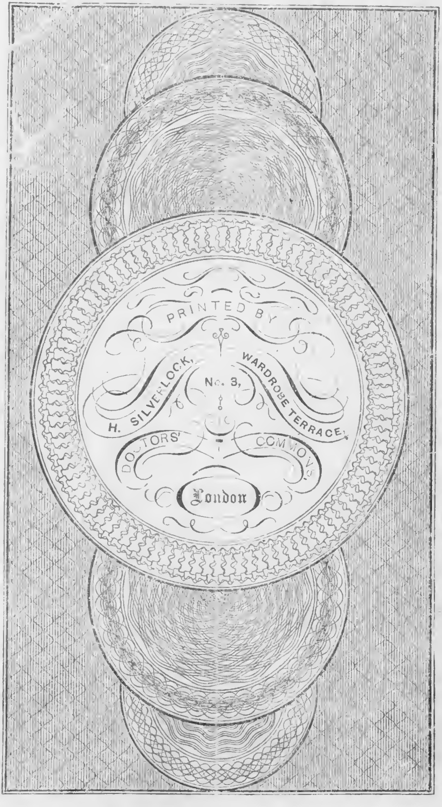

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